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ASSUMPTION OF FLOOD RISK

Alexander B. Lemann*

2017 was the costliest year for flood damage in American history. Somewhat fortuitously, the beleaguered National Flood Insurance Program came up for reauthorization just as the country was bearing the brunt of Hurricanes Harvey, Irma, and Maria. With the program at its borrowing limit and facing the prospect of being unable to pay claims, Congress punted on the question of long-term reform by forgiving its past debt and extending its reauthorization deadline. That deadline has since been extended seven more times, with little substantive discussion of the widely-felt need for reform.

Scientists expect a warmer climate to cause more intense rainfall, more powerful hurricanes, and higher sea levels, all of which will significantly worsen the flood risk we face. Meanwhile, many see federal policy as failing to encourage sustainable development. Indeed, the dominant view of experts is that programs like the National Flood Insurance Program (“NFIP”) have made the problem worse, by insulating property owners from the effects of storms and thus artificially inflating the value of flood-prone real estate. This viewpoint, however, assumes that the purpose of federal policy in this area should be to incentivize some objectively optimal level of exposure to the risk of floods. The behavior of policymakers, on the other hand, strongly suggests that this utilitarian approach to the problem is not the only—or even the default—way of thinking about our exposure to risk.

Drawing on tort doctrine, and particularly the defense of assumption of risk, I argue that there is instead a set of deeply moral instincts underlying our response to flood risk. The doctrine of assumption of risk assigns responsibility for the realization of risks not when our decisions to confront them are objectively rational, but rather when they are made freely, with meaningful knowledge of the risk and a choice of whether to accept it. These ideas, I argue, can already be detected in the rate structure of the NFIP, and yet they are largely ignored in the broader policy debate about how best to share the burden of flood risk. If tort law represents a distillation and

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application of our common moral intuitions about risk and responsibility, it can shed light on how this complex problem should be resolved.

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INTRODUCTION

After spending four days dumping an unprecedented quantity of water on the Houston area, Hurricane Harvey finally slid off the coast to the south, leaving the city to begin the gradual process of wringing itself out and evaluating the damage.¹ Major storms are often treated as showing us something we should have known all along. For many, Hurricane Harvey's lesson was that the era of climate change—the Anthropocene—is well under way. By the time Harvey reached Houston it was no longer a particularly powerful storm, by the traditional measure of sustained wind speed.² But, thanks to the fact that warmer air can hold more moisture, the quantity of water it dropped was truly immense.³ Multiple rainfall gauges in Houston recorded quantities of water that exceeded previous records in the continental United States by 26%.⁴

Another story told about Harvey was a cautionary tale. Houston, low-lying and laced with bayous, has always been flood-prone. But a quick series of bad floods within the past three years suggested a worsening problem. To many, the storms were illustrations of the perils of the unchecked development for which Houston is famous.⁵ By paving over so much of the open prairie that once surrounded it, Houston had given the water nowhere

1. ERIC S. BLAKE & DAVID A. ZELINSKY, NAT'L HURRICANE CTR., TROPICAL CYCLONE REPORT: HURRICANE HARVEY 1, 56 (2018), https://www.nhc.noaa.gov/data/tcr/AL092017_Harvey.pdf [<https://perma.cc/U94T-DLWM>].

2. *Id.*

3. Technically, scientists are able to say not that climate change caused Harvey itself but rather that it dramatically increases the chance of a Harvey-like event occurring. *See* Mark D. Risser & Michael F. Wehner, *Attributable Human-Induced Changes in the Likelihood and Magnitude of the Observed Extreme Precipitation During Hurricane Harvey*, 44 GEOPHYSICAL RES. LETTERS 12,457, 12,457 (2017) (finding that “human-induced climate change *likely* increased the chances of the observed precipitation accumulations during Hurricane Harvey . . . by a factor of at least 3.5”). Another factor thought to be linked to climate change is the way Harvey “stalled” near Houston. Weather patterns at the time had pushed the jet stream to the north, a condition that is associated with climate change. Michael E. Mann, *It's a Fact: Climate Change Made Hurricane Harvey More Deadly*, GUARDIAN (Aug. 28, 2017, 10:07 AM), <https://www.theguardian.com/commentisfree/2017/aug/28/climate-change-hurricane-harvey-more-deadly> [<https://perma.cc/C2QF-X7JR>].

4. BLAKE & ZELINSKY, *supra* note 1, at 6.

5. *See, e.g.*, Manny Fernandez & Richard Fausset, *A Storm Forces Houston, the Limitless City, To Consider Its Limits*, N.Y. TIMES (Aug. 30, 2017), <https://nyti.ms/2wpnVPq> [<https://perma.cc/BRQ2-3J42>] (noting that “developers’ encroachment into the wetlands and prairies that used to serve Houston as natural sponges has inevitably exacerbated the misery that the city is suffering today”). The amount of impervious surface in Harris County increased by 25% between 1996 and 2011. Neena Satija, Kiah Collier & Al Shaw, *Boomtown, Flood Town*, PROPUBLICA (Dec. 7, 2016), <https://projects.propublica.org/houston-cypress/> [<https://perma.cc/D5P2-KDTV>].

else to go. Where once it might have soaked into marshy grasslands, it now slid across impermeable barriers of asphalt and concrete, filling bayous and reservoirs well past capacity.⁶

As an illustration of this hubris there was no better example than Canyon Gate, a neighborhood that was constructed entirely *within* one of Houston's two enormous flood control reservoirs. In a series of feature articles entitled *Built to Flood*, the *New York Times* profiled Canyon Gate, telling the story of its construction and destruction and the people who call it home.⁷ How could anyone be so foolish, the articles seem to ask, as to build a house inside a flood control reservoir? Canyon Gate might be the poster child for an argument that is frequently heard in the current debate over how to manage our ever-increasing flood risk. That argument holds that many of the people flooded in events like Hurricane Harvey knew the risks to which they were exposing themselves and thus deserve little of our sympathy or, perhaps more to the point, our money.⁸

As climate change causes rising sea levels, more intense hurricanes, and heavier rainfall all over America, the systems by which we allocate and redistribute the costs of flooding are being placed under increasing strain. The National Flood Insurance Program ("NFIP"), in particular, has come to be seen as the leading indication that our approach to the problem is "broken."⁹

6. See, e.g., Samuel D. Brody et al., *Identifying the Impact of the Built Environment on Flood Damage in Texas*, 32 DISASTERS 1, 1 (2008) (analyzing factors contributing to flood damage and finding that "naturally occurring wetlands play a particularly important role in mitigating flood damage").

7. Tim Wallace et al., *How One Houston Suburb Ended Up in a Reservoir*, N.Y. TIMES (Mar. 22, 2018), <https://nyti.ms/2FWQ9Ji> [<https://perma.cc/8LPA-VP5X>].

8. See ERIC RAKOWSKI, EQUAL JUSTICE 79 (1991) ("If a citizen of a large and geographically diverse nation like the United States builds his home in a flood plain, or near the San Andreas fault, or in the heart of tornado country, then the risk of flood, earthquake, or crushing winds is one he chooses to bear, since those risks could be all but eliminated by living elsewhere."); Greg Hanscom, *Dreading Water: Should Coastal Communities Bear the Cost of Future Floods?*, GRIST (Feb. 5, 2014), <https://grist.org/politics/dreading-water-should-coastal-communities-bear-the-cost-of-future-floods-2/> [<https://perma.cc/JQE5-Q7U8>] ("If you choose to live in a place that is vulnerable to storm surges or floods, you will have to take that risk upon yourselves."); Editorial, *Hold Strong on Flood Insurance*, WASH. POST (Feb. 2, 2014), https://www.washingtonpost.com/opinions/hold-strong-on-flood-insurance/2014/02/02/5305ac62-8ab5-11e3-833c-33098f9e5267_story.html [<https://perma.cc/CX2K-ZFYR>] ("[I]t takes some chutzpah for NFIP beneficiaries to act entitled to subsidies from the vast majority of taxpayers who chose not to live on the beach . . ."); Judith Kildow & Jason Scorse, *End Federal Flood Insurance*, N.Y. TIMES (Nov. 28, 2012), <https://nyti.ms/2wc09rm> [<https://perma.cc/F6DD-TP6E>] ("If they choose to live in harm's way, they should bear the cost of that risk — not the taxpayers.") .

9. Mary Williams Walsh, *A Broke, and Broken, Flood Insurance Program*, N.Y. TIMES (Nov. 4, 2017), <https://nyti.ms/2hEsXBi> [<https://perma.cc/6UJE-RHX7>].

Because the NFIP has been in debt to the Treasury since Hurricane Katrina in 2005, it is often described as providing a subsidy to its flood-prone policy holders in the form of artificially cheap insurance premiums.¹⁰ By the time the 2017 hurricane season had wound down, the NFIP's debt to the Treasury was rapidly approaching its statutory limit of \$30.4 billion.¹¹ With the entire program set to expire unless reauthorized by Congress in September, the time seemed ripe for wholesale reform.¹²

In both the popular press and the academic literature, there is near-universal agreement that reform of the NFIP should be focused on eliminating subsidized rates entirely, so that all policyholders pay rates that reflect the full measure of the risk they face individually, known as "actuarial" rates.¹³ One striking feature of this call for reform is how it differs

10. See, e.g., Ike Brannon & Ari Blask, *The Government's Hidden Housing Subsidy for the Rich*, POLITICO (Aug. 8, 2017), <https://www.politico.com/agenda/story/2017/08/08/hidden-subsidy-rich-flood-insurance-000495>.

11. Diane P. Horn, *National Flood Insurance Program Borrowing Authority*, FED'N AM. SCIENTISTS (Sep. 10, 2018), <https://fas.org/sgp/crs/homesec/IN10784.pdf> [<https://perma.cc/S3FX-LAAE>].

12. Walsh, *supra* note 9 (noting calls for reform from an "unusual coalition of insurers, environmentalists, and fiscal conservatives"). As the NFIP was approaching its borrowing limit in the early Fall of 2017, Mick Mulvaney, director of the Office of Management and Budget, sent a letter to Vice President Mike Pence and congressional leaders urging Congress to forgive \$16 billion of the NFIP's debt to cover expected claims from that season's hurricanes while also passing a package of long-term reforms. Letter from Mick Mulvaney to Michael Pence (Oct. 4, 2017), <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/Letters/Letter%20regarding%20additional%20funding%20and%20reforms%20to%20address%20impacts%20of%20recent%20natural%20disasters.pdf> [<https://perma.cc/9KWT-RYHR>]. The debt forgiveness was passed, but Congress has not yet acted on various proposed reforms.

13. See U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-17-425, FLOOD INSURANCE: COMPREHENSIVE REFORM COULD IMPROVE SOLVENCY AND ENHANCE RESILIENCE (2017), <https://www.gao.gov/assets/690/684354.pdf> [<https://perma.cc/SC34-ATZ8>]; Omri Ben-Shahar & Kyle D. Logue, *The Perverse Effects of Subsidized Weather Insurance*, 68 STAN. L. REV. 571, 571 (2016) (arguing that "existing government subsidies induce excessive development (and redevelopment) of storm-stricken and erosion-prone areas"); Robin Kundis Craig, *Harvey, Irma, and the NFIP: Did the 2017 Hurricane Season Matter to Flood Insurance Reauthorization?*, U. ARK. LITTLE ROCK L. REV. (forthcoming 2018); Chad J. McGuire, *Examining Legal and Regulatory Barriers to Climate Change Adaptation in the Coastal Zone of the United States*, 4 COGENT ENVTL. SCI. 1, 9 (2018) ("[T]he inherent subsidies created in national flood insurance and disaster relief must be removed so the public can properly gauge coastal risk."); Editorial, *Hold Strong on Flood Insurance*, *supra* note 8; Editorial, *How Federal Flood Insurance Puts Homes at Risk*, N.Y. TIMES (Aug. 31, 2017), <https://nyti.ms/2xBwGpL> [<https://perma.cc/V5P8-TB9N>] ("The biggest change would be to have premiums reflect the actual overall risk."). I took this position myself in my early writing on this topic. Alexander Lemann, *Rolling Back the Tide: Toward an Individual Mandate for Flood Insurance*, 26 FORDHAM ENVTL L. REV. 166, 210 (2015). There are notable exceptions to this consensus view. Robert Verchick and Lynsey Johnson, for example, are careful to note the harsh effects a wholesale adoption of actuarial rates

from the way we manage many other forms of risk.¹⁴ Another is that it has been tried before. In 2012, Congress passed the Biggert-Waters Flood Control Act, which eliminated virtually all categories of subsidized premiums.¹⁵ Twenty months later, facing a groundswell of opposition, Biggert-Waters was largely repealed.¹⁶ Despite being treated as the obviously wise policy solution to the problem of flood risk by experts from across the political spectrum, actuarial rates have proved to be elusive.

The call for actuarial rates is usually based on two related ideas. First, by eliminating too-cheap subsidized rates, the NFIP would presumably collect more in premiums, helping offset its losses in years with major floods and making it possible for the program to work off its debt.¹⁷ Second, by charging rates that reflect the full magnitude of the risk homeowners are facing, the NFIP can provide a meaningful signal of that risk, incentivizing efficient levels of precaution.¹⁸ The instinct underlying this latter argument is that people choose where to live with some knowledge of the flood risk they face and, if that risk changes, they can choose to leave. This instinct is sometimes translated into a moral claim, that flood risk should not be socialized because it is a risk people assume, like the risk of smoking and unlike the risk of being old. The quick demise of Biggert-Waters suggests that this assumption of risk instinct deserves more attention. In the policy discussion swirling around

would have. See Robert R.M. Verchick & Lynsey R. Johnson, *When Retreat Is the Best Option: Flood Insurance After Biggert-Waters and Other Climate Change Puzzles*, 47 J. MARSHALL L. REV. 695, 715–16 (2014) (noting that “cutting subsidies” “could lead to sudden instability in local housing markets and push financially strapped owners out of the insurance market altogether, increasing their vulnerability”); see also Adam F. Scales, *A Nation of Policyholders: Governmental and Market Failure in Flood Insurance*, 26 MISS. C. L. REV. 3, 44–45 (2006) (noting that “[e]liminating the grandfathering provisions overnight would cause a collapse in home values” and proposing instead that subsidies be phased out over a 15 year period).

14. See *infra* Part II.A.

15. Biggert-Waters Flood Ins. Reform Act of 2012, Pub. L. No. 112-141, Title II, § 100205, 126 Stat. 916.

16. See Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, 128 Stat. 1020.

17. See, e.g., U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 13, at 2 (“Eliminating rate subsidies by requiring all rates to reflect the full risk of loss would address an underlying cause of NFIP’s debt and minimize federal fiscal exposure.”).

18. See, e.g., Ben-Shahar & Logue, *supra* note 13, at 571 (arguing that “existing government subsidies induce excessive development (and redevelopment) of storm-stricken and erosion-prone areas”); Scales, *supra* note 13, at 44 (“Something approaching the market rate is absolutely essential to signal to consumers that lakeshore views are expensive.”); Michael Faure & Qihao He, *Private Law and Climate Disasters: Insurance Law*, in RESEARCH HANDBOOK ON CLIMATE DISASTER LAW: BARRIERS AND OPPORTUNITIES 348, 357 (Rosemary Lyster & Robert R.M. Verchick eds., 2018); Craig, *supra* note 13.

flood insurance, these deeper questions—whether and to what degree we want to socialize the cost of floods, and if so how—are rarely asked.

This Article makes several contributions to this debate. First, it foregrounds the primarily moral questions lurking behind proposals to reform the NFIP and begins to address them explicitly. The assumption of risk instinct is a common one: there is a sense that people who choose to take on a risk should be responsible for its realization, while those who are exposed to a risk unknowingly or involuntarily deserve our aid. But, I argue, it is often wrong to say that people living in flood-prone properties knew the risk they faced *ex ante* and chose to accept it. Drawing on tort law's articulation of this moral concept—the doctrine of assumption of risk—I argue that this view is troublingly simplistic.¹⁹ In fact, many people do not understand the flood risk they face in any meaningful sense, and many people do not have a range of choices when deciding where to live.

Canyon Gate is a perfect example. Although the entire subdivision is built within the maximum “flood pool” of the Barker Reservoir, the reservoir itself is normally dry. When it's not flooded, it contains a large park, complete with soccer and baseball fields, horse riding trails, a dog park, and—this being Texas—a shooting range.²⁰ When the federal government completed

19. My argument is not that this area is governed by tort law in any positivist sense, but rather that tort doctrines reflect a distillation and application of our shared moral intuitions and thus can shed light on how this problem should (for both normative and practical reasons) be resolved. Cf. Daniel Schwarcz, *A Products Liability Theory for the Judicial Regulation of Insurance Policies*, 48 WM. & MARY L. REV. 1389 (2007) (drawing on products liability law as a framework for regulating insurance policies). In a methodological sense, this project helps fill a gap in the literature on disaster law and climate change adaptation, which is largely utilitarian in its approach. Just as it is now commonplace for theorists to recognize two dominant views of tort law—a wealth-maximization or efficiency view and a moral or deontological view—I believe disaster law is susceptible to both modes of analysis. The question most often asked of law in the context of natural disasters is how it can best be used to nudge us towards some optimal level of investment in risk mitigation, but disaster law also benefits from philosophical analysis, which helps shed light on behaviors that appear irrational and unjustifiable from a purely economic perspective. In this sense I see this project as building on a limited body of work that approaches these problems from a similar perspective. See, e.g., MICHELE LANDIS DAUBER, *THE SYMPATHETIC STATE: DISASTER RELIEF AND THE ORIGINS OF THE AMERICAN WELFARE STATE* (2013); VIVIANA A. ROTMAN ZELIZER, *MORALS AND MARKETS: THE DEVELOPMENT OF LIFE INSURANCE IN THE UNITED STATES* (1979); *EMBRACING RISK: THE CHANGING CULTURE OF INSURANCE AND RESPONSIBILITY* (Tom Baker & Jonathan Simon eds., 2002); Kenneth S. Abraham, *Efficiency and Fairness in Insurance Risk Classification*, 71 VA. L. REV. 403 (1985); Molly J. Walker-Wilson, *Cultural Understandings of Risk and the Tyranny of the Experts*, 90 OR. L. REV. 113 (2011).

20. See *Recreation in Addicks and Barker*, U.S. ARMY CORPS ENGINEERS, <https://www.swg.usace.army.mil/Missions/Dam-Safety-Program/Addicks-Barker-Recreation/> [<https://perma.cc/S6Q9-RCXN>] (last visited Mar. 4, 2019).

construction of the 13-mile-long earthen dam that encircles the reservoir in 1945,²¹ the area was mostly undeveloped prairie.²² The government then began buying up the land within the reservoir. In a decision that would prove to be consequential, the government stopped short of buying all land within the reservoir's maximum flood pool. Instead, it purchased only the land that would be flooded during a statistical construct colloquially known as a "100-year flood," a flood with a 1% chance of occurring in any given year.²³ Areas outside the 100-year flood plain were left in private hands, free to be developed into residential neighborhoods in the 1980s, when Houston's sprawl reached the area for the first time.²⁴ Meanwhile, most of the people who moved in had "no clue" that their properties were susceptible to flooding.²⁵ Filling up Barker Reservoir completely—and thereby flooding places like Canyon Gate—would require a more severe and therefore less likely flood, one with a 500-year or even a 1,000-year return interval. Hurricane Harvey was just such a flood.²⁶

21. GALVESTON DIST., U.S. ARMY CORPS OF ENG'RS, WATER CONTROL MANUAL 3-2 (2012), <https://www.swg.usace.army.mil/Portals/26/docs/water%20control%20manual/2012%20water%20control%20manual.pdf> [<https://perma.cc/EG4P-ZPZH>].

22. Neena Satija, Kiah Collier & Al Shaw, *Everyone Knew Houston's Reservoirs Would Flood—Except for the People Who Bought Homes Inside Them*, PROPUBLICA, (Oct. 12, 2017) <https://projects.propublica.org/graphics/harvey-reservoirs> [<https://perma.cc/4NHR-3878>].

23. Complaint at 7, *Micu v. United States*, 17-CV-01277 (Fed. Cl. Sept. 15, 2017). The two reservoirs were designed to capture and store more water than would fall during a 100-year storm. Instead, engineers estimated the probable maximum rainfall that could be expected to occur in the area, based on a storm that dumped over thirty inches of rain in seventy-two hours in 1899. *Id.* at 6. Subsequent storms, including Tropical Storm Claudette in 1979, caused the Corps to revise its estimate of the probable maximum rain upwards to forty inches in seventy-two hours, and to increase the height of Barker and Addicks dams, thereby increasing the size of the area they could flood. *Id.* at 5–6.

24. Wallace et al., *supra* note 7.

25. Wallace et al., *supra* note 7; Satija, Collier & Shaw, *supra* note 22; *see also* Audra D.S. Burch, *Brutal Choice in Houston: Sell Home at a Loss or Face New Floods*, N.Y. TIMES (Mar. 30, 2018), <https://nyti.ms/2uwOW6b> [<https://perma.cc/SU5R-PPLN>]; James Drew, *Canyon Gate Homeowners Were Not Warned About Potential Flooding*, HOUS. CHRON. (Oct. 7, 2017), <https://www.houstonchronicle.com/news/houston-texas/houston/article/Canyon-Gate-bond-prospectuses-did-not-warn-12259584.php> [<https://perma.cc/442S-E667>]; Editorial, *Homeowners May Have Had No Idea They Were in Flood Pool, But Many Others Did*, HOUS. CHRON. (Oct. 4, 2017), <https://www.houstonchronicle.com/opinion/editorials/article/Homeowners-may-have-had-no-idea-they-were-in-a-12253803.php> [<https://perma.cc/ZU5W-925S>].

26. Residents of Canyon Gate have filed a class action lawsuit against the federal government, arguing that the flooding of the area constituted a taking for which the plaintiffs are entitled to compensation. Complaint, *Micu v. United States*, 17-CV-01277, (Fed. Cl. Sept. 15, 2017). Canyon Gate is not the only neighborhood located within one of Houston's flood control reservoirs. There are about 2,000 acres of privately owned land containing thousands of homes located within Addicks and Barker Reservoirs. Satija, Collier & Shaw, *supra* note 22.

The story of Canyon Gate illustrates how hard it is for individuals to “know” the risk of flooding they face, and to process that knowledge when making choices about where to live. In fact, the project of knowing the flood risk one faces is fraught with difficulty. The science of flood risk is necessarily inexact, and the way FEMA digests that science and produces the flood maps that form the building blocks of the NFIP is deeply flawed. The idea of choice is similarly thorny. Many Americans do not choose where to live from among a menu of cities and neighborhoods with diverse exposure to the risk of flooding. These observations suggest that there is a significant group of people who are entitled to some assistance in paying for flood insurance. We should thus be more sensitive to the argument that people are entitled to continue paying less than actuarial premiums for flood insurance based not just on pure need, but also on factors like the length of time they have lived in a particular place and when their home was constructed, both of which affect rate calculations today. On the other hand, there is also a significant group of people who likely *did* know the risk and choose to encounter it, and this group should not be entitled to continue paying subsidized rates, nor should individual properties carry with them an entitlement to subsidized rates regardless of who lives in them, as they do now.

This Article proceeds as follows. Part I provides a brief overview of the National Flood Insurance Program, with particular emphasis on its rate structure, the looming threat of climate change, and current proposals for reform. In Part II I draw on literature from insurance law and tort law to show, first, that the “actuarial model” of insurance is but one way of viewing and structuring insurance systems and, second, that the moral argument that flood risk should not be socialized because people subject to it have assumed it is dated and unpersuasive unless it incorporates meaningful conceptions of knowledge and choice, much as tort law has over the course of the twentieth century. Part III examines the problem of knowing the risk of flooding, and argues that many individuals lack meaningful knowledge of their risk. Part IV argues, similarly, that many people do not choose where they are going to live under conditions of freedom. Part V suggests implications of these ideas for reform of the NFIP.

I. RISING TIDE, RISING COSTS

The federal government socializes the costs of flooding in a variety of ways, including building and maintaining flood control structures, passing massive aid packages in the wake of major storms, and, most importantly for this paper, through the NFIP. While the total claims paid by the NFIP in the

wake of even major storms like Harvey or Katrina are usually dwarfed by one-off aid packages passed by Congress, they are often far larger for the individuals who receive them.²⁷ NFIP coverage is also a liability rather than a discretionary aid package, and the total size of that liability is significant: currently about \$1.3 trillion.²⁸ This exposure has drawn increasing attention, as a series of historically significant losses and increasing awareness of the impacts of climate change on the nation's flood risk have highlighted the degree to which the NFIP appears to be operating at a long-term deficit.

A. *A Brief Overview of the NFIP*

The NFIP was created in 1968, after decades of severe floods that had driven private insurers out of the market for flood insurance. The reasons for the insurance industry's unwillingness to write flood insurance policies have been the subject of some debate, but two factors are widely thought to have played a crucial role: first, the extreme difficulty of understanding the risk faced by an individual policyholder (and thus setting premiums at levels that will cover expected losses), and second, a feature of flood risk known as correlation.²⁹ When risks are correlated, they are likely to occur at the same time, leading to large and unevenly distributed losses for insurers. After Hurricane Betsy (the country's first billion-dollar storm) struck the Gulf Coast in 1965, Congress directed the Department of Housing and Urban Development to prepare a report on the feasibility of a comprehensive approach to compensating flood victims.³⁰ That report recommended the

27. The average NFIP claim paid for damage caused by Hurricane Harvey, for example, was \$115,430, while the maximum amount of aid funding available under FEMA's Individuals and Households Program is \$34,000. *Significant Flood Events*, FEMA, <https://www.fema.gov/significant-flood-events> [<https://perma.cc/J7EB-J6J4>] (last updated Jan 10, 2019); Notice of Maximum Amount of Assistance Under the Individuals and Households Program, 82 Fed. Reg. 196 (Oct. 12, 2017). On the other hand, the total NFIP claims paid for the three 2017 Hurricanes was \$9.8 billion, compared with roughly \$120 billion in Congressional appropriations (not including NFIP debt relief). See Brett Lingle, Carolyn Kousky & Leonard Shabman, *Federal Disaster Rebuilding Spending: A Look at the Numbers*, WHARTON, U. PA.: RISK MGMT. & DECISION PROCESSING CTR. (Feb. 22, 2018), <https://riskcenter.wharton.upenn.edu/disaster-aid/federal-disaster-rebuilding-spending-look-numbers/> [<https://perma.cc/8FXH-YE83>].

28. *Policy Statistics*, FEMA, <https://bsa.nfipstat.fema.gov/reports/1011.htm> [<https://perma.cc/XY5Q-JE8Y>] (last updated Sept. 30, 2018).

29. See Edward T. Pasterick, *The National Flood Insurance Program*, in *PAYING THE PRICE: THE STATUS AND ROLE OF INSURANCE AGAINST NATURAL DISASTERS IN THE UNITED STATES* 125, 126 (Howard Kunreuther & Richard J. Roth eds., 1998).

30. *Id.*

creation of a national flood insurance program, which Congress did by passing the National Flood Insurance Act of 1968.

In its role as administrator of the NFIP, FEMA undertakes three basic tasks. First, it studies the risk of flooding in every flood-prone community in the country, with the aim of developing detailed maps (“Flood Insurance Rate Maps,” or “FIRMs”) that show, for any individual property, the likelihood of being flooded. Second, FEMA promulgates regulations that are aimed at mitigating the risk of flooding in communities that participate in the NFIP (technically, the regulations direct local governments to incorporate the mitigation requirements into their building codes).³¹ The most significant of these requirements is that all new homes within “Special Flood Hazard Areas” (areas with a 1% chance of flooding in any given year) be elevated such that their living areas will remain dry during a 100-year flood.³² Finally, FEMA sets rates for flood insurance.

Initially, the NFIP did not have a purchase mandate, and it relied on cheap premiums to attract policyholders.³³ From the beginning, one problem was the premiums that would be charged to houses that existed when the program was created. Homes that post-date the creation of a flood map covering their area are subject to the building code’s elevation requirements and therefore have far lower expected losses in the event of a 100-year flood. Their flood insurance premiums are thus lower. Homes that predate the creation of a map are subject to no such requirements (the NFIP does not require that *existing* homes be elevated unless they are “substantially”—more than 50%—damaged in a storm)³⁴ and thus face a much higher risk. At least in part to induce participation in the NFIP,³⁵ FEMA created a category of rates it calls “chargeable” rates (more often referred to as “subsidized” rates)³⁶ that apply to two major groups of policyholders. First, properties that were constructed before the issuance of a FIRM are entitled to purchase flood insurance at subsidized rates.³⁷ Second, properties whose rates increase are entitled to pay their old, “grandfathered” rates, which are often substantially below FEMA’s current estimate of full actuarial rates.³⁸

This approach to attracting policyholders was essentially a failure, and in 1973 Congress required all properties located within Special Flood Hazard

31. See 44 C.F.R. §§ 60.2, 60.3 (2018).

32. § 60.3(c)(2).

33. Pasterick, *supra* note 29, at 132–34.

34. 44 C.F.R. § 59.1.

35. Pasterick, *supra* note 29, at 134.

36. 44 C.F.R. §§ 59.1, 61.7.

37. Pasterick, *supra* note 29, at 132.

38. U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 13, at 7.

Areas that have a mortgage from a federally-insured lending institution to carry flood insurance.³⁹ Despite the addition of a purchase mandate, Congress did not eliminate subsidized rates. Although their share as a percentage of the total pool of policyholders has decreased substantially, subsidized rates are still paid by about 20% of policyholders.⁴⁰ In 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act, which eliminated significant categories of subsidized rates and was hailed as a major bipartisan success.⁴¹ Biggert-Waters eliminated the practice of “grandfathering” old rates⁴² and also eliminated subsidized rates for second homes, properties that undergo substantial flood damage or improvements, properties that have flooded numerous times, and businesses.⁴³ Moreover, under the new law, new owners of a home would no longer be able to continue paying the subsidized rates enjoyed by their predecessors.⁴⁴ Those who acquired flood insurance for the first time would also not be entitled to subsidized rates.⁴⁵

Biggert-Waters, poised to move most policyholders to full actuarial rates, attracted enormous controversy. As homeowners received notices that their rates would be skyrocketing, opposition to the new law began to build in many flood-prone communities. What had been hailed as a bipartisan success now attracted bipartisan scorn.⁴⁶ Particularly moving were anecdotal reports that individuals would now be required to pay truly crushing flood insurance premiums—in one case, a woman reported that her premiums were set to increase from \$595 a year to \$4,492, on a \$90,000 home.⁴⁷ Also noted were widespread fears that the law was having a sudden impact on the real estate

39. Flood Disaster Protection Act of 1973, Pub. L. No. 93-234 (codified at 42 U.S.C. §§ 4001–4129 (2018)).

40. U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 13, at 6.

41. Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No. 112-141, § 100205, 126 Stat. 405, 917 (codified at 42 U.S.C. § 4014 (2018)). The bill enjoyed support from both fiscal conservatives, concerned by the NFIP’s drain on taxpayers, and environmentalists, who saw higher flood insurance premiums as a way to incentivize more sustainable development.

42. § 100207.

43. § 100205(a)(1)(A).

44. § 100205(a)(1)(B).

45. *Id.* The law also increased the cap on annual premium increases. These changes and their history are discussed in more detail in Lemann, *supra* note 13, at 192–96.

46. See, e.g., Coral Davenport, *Popular Flood Insurance Law Is Target of Both Parties*, N.Y. TIMES (Jan. 28, 2014), <https://nyti.ms/1k4eRCw> [<http://perma.cc/G2QG-YSXJ>] (“Diane Mazzuca . . . had been paying \$595 annually for flood insurance on her \$90,000 home. After Biggert-Waters ended federal flood insurance subsidies last June, she got an updated bill—for \$4,492.”).

47. *Id.*

market, potentially wiping out many homeowners' equity.⁴⁸ One of the law's lead sponsors, Maxine Waters, claimed she had had no idea the effect it would have and supported its repeal.⁴⁹

Just twenty months after Biggert-Waters was passed, Congress passed the Homeowner Flood Insurance Affordability Act of 2014 ("HFIAA"), which largely repealed it. The Act reinstated subsidized rates for new policies and newly purchased properties.⁵⁰ It also reinstated, with some new limitations, the practice of grandfathering rates.⁵¹ The cost of these changes was offset, at least in theory, by a new \$25 annual surcharge on all residential policies and a \$250 surcharge on policies covering businesses and second homes.⁵² The Homeowner Flood Insurance Affordability Act was Congress's last significant reform to the NFIP. Since then the program's fortunes have not prospered.

B. *The Stresses of Climate Change*

Until 2005, the NFIP typically collected enough in premiums to cover the claims it paid to flood victims.⁵³ In one season, Hurricanes Katrina, Rita, and Wilma combined to create \$19 billion in claims (more than the entire cumulative losses of the program since its creation), easily overwhelming the NFIP's reserves and forcing it to borrow from the Treasury.⁵⁴ This necessitated an increase in its statutory borrowing limit (which had been \$1.5 billion).⁵⁵ The borrowing limit was increased several more times in subsequent years, as losses from other storms (most notably Hurricane Sandy) continued to build and the program began making onerous interest

48. See, e.g., Lizette Alvarez & Campbell Robertson, *Cost of Flood Insurance Rises, Along with Worries*, N.Y. TIMES (Oct. 12, 2013), <https://nyti.ms/1bO4G4P> [<http://perma.cc/XNG4-RH4T>] (reporting that in some areas "home sales have come to a near standstill").

49. Davenport, *supra* note 46. As some commentators have observed, this claim is dubious at best. Verchick & Johnson, *supra* note 13, at 711–12.

50. Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, § 3, 128 Stat. 1020, 1021–22 (striking portions of Biggert-Waters § 100205, Pub. L. No. 112-141, 126 Stat. 405, 917 (codified at 42 U.S.C. § 4014(g)(1)–(2) (2018))).

51. *Id.* § 4.

52. *Id.* § 8.

53. NAT'L RESEARCH COUNCIL, REDUCING COASTAL RISKS ON THE EAST AND GULF COASTS 50 (2014); see also RACHEL CLEETUS, OVERWHELMING RISK: RETHINKING FLOOD INSURANCE IN A WORLD OF RISING SEAS 8 (2013) (showing NFIP's cumulative debt over time). The largest debt the NFIP had before Katrina was \$917 million, incurred in 1997 and paid off at the end of 2003. Horn, *supra* note 11.

54. NAT'L RESEARCH COUNCIL, *supra* note 53, at 50. The program is statutorily entitled to ask the Treasury for loans when it experiences shortfalls. 42 U.S.C. § 4016 (2018).

55. Horn, *supra* note 11.

payments.⁵⁶ When Hurricanes Harvey, Irma, and Maria arrived in 2017, the NFIP quickly hit its new \$30 billion borrowing limit. To make the program solvent, Congress cancelled \$16 billion worth of its debt.⁵⁷ Despite that relief, the NFIP currently owes \$20.525 billion to the Treasury.⁵⁸

There are widely thought to be two major contributors to the program's recent financial woes. First is the widespread development that has occurred in the past few decades in flood-prone areas along the coasts.⁵⁹ Second, and perhaps far more significant, is climate change. While scientists are generally loath to assign the blame for any individual event to climate change,⁶⁰ there is broad consensus that a warming atmosphere will make flooding worse in a variety of ways. Warmer oceans might provide more energy to hurricanes, making them more destructive.⁶¹ Warmer air holds more moisture, increasing the potential for extreme rainfall and flooding from rivers.⁶² And finally, and perhaps most catastrophically, thermal expansion and melting ice will cause sea levels to rise permanently, causing increasingly frequent "nuisance flooding" on sunny days, increasingly destructive surges on stormy ones, and finally, permanent inundation.

The precise effect of all these changes on the flood risk in any given area is extraordinarily difficult to predict.⁶³ But the overall effect on the country

56. *Id.* The NFIP currently pays about \$400 million per year in interest to the Treasury. *Id.* Since 2005, it has paid \$4.2 billion in interest and \$2.82 billion in principal. *Id.*

57. *Id.*

58. *Id.*

59. Raymond J. Burby, *Hurricane Katrina and the Paradoxes of Government Disaster Policy: Bringing About Wise Governmental Decisions for Hazardous Areas*, 604 ANNALS AM. ACAD. POL. & SOC. SCI. 171, 173–76 (2006); Scott Gabriel Knowles & Howard C. Kunreuther, *Troubled Waters: The National Flood Insurance Program in Historical Perspective*, 26 J. POL'Y HIST. 327, 327–28 (2014); Oliver A. Houck, *Rising Water: The National Flood Insurance Program and Louisiana*, 60 TUL. L. REV. 61, 62–63, 66 (1985).

60. This is beginning to change. See Henry Fountain, *Scientists Link Hurricane Harvey's Record Rainfall to Climate Change*, N.Y. TIMES (Dec. 13, 2017), <https://nyti.ms/2nYKTMz> [<http://perma.cc/9FFM-YJRR>] (noting that "for years most scientists had said it was extremely difficult to link warming to specific events. [But] [t]hat has now changed").

61. NAT'L RESEARCH COUNCIL, *supra* note 53, at 14–16 (noting that climate models predict a decrease in the number of hurricanes but also an increase in their intensity and rainfall rates).

62. U.S. GLOB. CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES 7–14 (Jerry M. Melillo, Terese Richmond & Gary W. Yohe eds., 2014), <https://nca2014.globalchange.gov/downloads> [<http://perma.cc/6KPJ-B8XR>] (last visited Dec. 22, 2018). This problem was vividly illustrated in August 2016, when rainfall in southern Louisiana caused flooding that killed thirteen people and displaced tens of thousands. The event was the eighth since May 2015 involving a quantity of rainfall statistically rare enough to have only a 0.2% chance of occurring in any given year (also known as a 500-year flood). Jonah Engel Bromwich, *Flooding in the South Looks a Lot Like Climate Change*, N.Y. TIMES (Aug. 16, 2016), <https://nyti.ms/2bkXOkk> [<http://perma.cc/CH2P-M889>].

63. See *infra* Part III.A.

and on the NFIP will be extreme. A recent report released by the Union of Concerned Scientists attempted to project the impact sea level rise will have on coastal real estate. The report estimated that within fifteen years, 147,000 existing homes and 7,000 commercial properties, collectively worth \$63 billion, will be at risk of “chronic inundation” (defined as at least twenty-six floods per year).⁶⁴ By 2100, 2.4 million residential properties (home to 4.7 million people) and 107,000 commercial properties worth more than \$1 trillion will be effectively underwater.⁶⁵ Other studies have produced similar figures.⁶⁶ In many places these effects are already beginning to be felt.⁶⁷

C. *Proposals for Reform: The Current Landscape*

The NFIP’s fiscal troubles and the likely effects of climate change suggest to most observers that the program is in dire need of reform. The NFIP has always had two goals that are to some extent inherently in tension. First, it aims to provide coverage that helps soften the financial impact of major floods. And second, it aims to help lessen the effects of floods themselves by imposing adaptation requirements on new construction in floodplains. The program’s spiraling debt implies that something about this model is broken.

To many, the program’s debt suggests a massive subsidy flowing from taxpayers to the residents of flood-prone houses. On this view, the NFIP encourages people to live in harm’s way, by partially externalizing the costs of flooding. In insurance this is called a moral hazard, the idea that providing insurance against a risk can increase its likelihood (think of the driver who

64. UNION OF CONCERNED SCIENTISTS, UNDERWATER: RISING SEAS, CHRONIC FLOODS, AND THE IMPLICATIONS FOR US COASTAL REAL ESTATE 4–5 (2018), <https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf> [<http://perma.cc/92XN-UDG3>].

65. *Id.* at 5.

66. See Tatiana Schlossberg, *Rising Sea Levels May Disrupt Lives of Millions, Study Says*, N.Y. TIMES (Mar. 14, 2016), <http://www.nytimes.com/2016/03/15/science/rising-sea-levels-global-warming-climate-change.html> [<http://perma.cc/BNT4-JT83>]; see also Matthew E. Hauer et al., *Millions Projected to Be at Risk from Sea-Level Rise in the Continental United States*, 6 NATURE CLIMATE CHANGE 691, 691 (2016) (concluding that coastal inundation could lead to a population shift comparable to the “Great Migration” of African-Americans out of the South in the twentieth century).

67. Justin Gillis, *Seas Are Rising at Fastest Rate in Last 28 Centuries*, N.Y. TIMES (Feb. 22, 2016), <https://www.nytimes.com/2016/02/23/science/sea-level-rise-global-warming-climate-change.html> [<http://perma.cc/985S-QCM2>] (noting that “increasingly routine” flooding is “making life miserable in places like Miami Beach; Charleston, S.C.; and Norfolk, Va., even on sunny days”); Justin Gillis, *Flooding of Coast, Caused by Global Warming, Has Already Begun*, N.Y. TIMES (Sept. 3, 2016), <http://www.nytimes.com/2016/09/04/science/flooding-of-coast-caused-by-global-warming-has-already-begun.html> [<http://perma.cc/SG6M-HXR2>].

speeds through town, comfortable in the knowledge that any damage will be covered).⁶⁸ Risk-rated premiums are a way of combatting moral hazard (increase the driver's premiums for speeding and you might discourage that behavior), but the NFIP is unable to charge premiums that are adequately risk-rated whenever policyholders are entitled by law to pay less than actuarial rates. The NFIP's debt is also seen as problematic in absolute terms. The U.S. Government Accountability Office has featured the NFIP on its "High-Risk List" since 2006 and highlights the risk the program poses to the Treasury.⁶⁹

The NFIP has thus attracted a diverse coalition of critics. To small-government types, it is yet another endeavor the government should leave to the private sector.⁷⁰ To fiscal conservatives, its huge exposure to catastrophic losses that get passed on to the Treasury is cause for concern.⁷¹ To environmentalists, it encourages flood-prone development, which harms fragile wetland and coastal ecosystems, and helps us ignore the long-term

68. See Alexander B. Lemann, *Coercive Insurance and the Soul of Tort Law*, 105 GEO. L.J. 55, 59–61 (2016).

69. U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-17-317, HIGH RISK SERIES: PROGRESS ON MANY HIGH-RISK AREAS, WHILE SUBSTANTIAL EFFORTS NEEDED ON OTHERS 58 (2017), <https://www.gao.gov/assets/690/682765.pdf> [<http://perma.cc/3KEK-RXSK>] [hereinafter HIGH RISK SERIES].

70. See, e.g., IKE BRANNON & ARI BLASK, REFORMING THE NATIONAL FLOOD INSURANCE PROGRAM: TOWARD PRIVATE FLOOD INSURANCE 4 (Cato Inst. Policy Analysis No. 817, 2017), https://object.cato.org/sites/cato.org/files/pubs/pdf/pa817_2.pdf [<http://perma.cc/S4PF-2W6L>] (arguing that the NFIP's problems are "endemic to any government insurance scheme" and that they "show[] the importance of a growing private flood insurance market as an alternative to government-run insurance"); Editorial, *The Swampland Republicans: GOP Senators Balk at Even Modest Fixes in Federal Flood Insurance*, WALL ST. J. (Jan. 16, 2018), <https://www.wsj.com/articles/the-swampland-republicans-1516145995> [<http://perma.cc/P5P4-969E>] ("The larger question is why government underwrites flood insurance when consumers privately insure against car accidents, fires and other events that damage property.").

71. See, e.g., DIANE KATZ, THE NATIONAL FLOOD INSURANCE PROGRAM: DROWNING IN DEBT AND DUE FOR PHASE-OUT 2 (Heritage Found. Backgrounder No. 3224, 2017), <https://www.heritage.org/sites/default/files/2017-06/BG3224.pdf> [<http://perma.cc/KU73-D5FZ>] ("Tinkering with operational reforms will not remedy the distortionary incentives inherent in a government insurance scheme—especially because the NFIP, as designed, is financially unsound.").

costs and consequences of climate change.⁷² For liberals, the NFIP looks suspiciously like a boon to wealthy southerners with coastal mansions.⁷³

In a way, the preceding paragraph overstates the political valence of the NFIP; one can read dozens of critics of the program without being made aware of their political leanings.⁷⁴ That is in part because the NFIP appears to be so illogical that one need not appeal to any prior political commitment to make a convincing case against it. There is a rationalist, utilitarian strain in modern political thought that is common ground for elites of both parties. From the perspective of incentives and rational policy, it seems obvious that the NFIP needs to be “fixed,” so that it no longer encourages clearly sub-optimal behavior. In a nation of nudges, the NFIP seems to be nudging us in the wrong direction.

The call for reform of the NFIP thus virtually always includes the idea that, among other fixes and tweaks, policyholders should be paying full actuarial rates.⁷⁵ Some favor simply eliminating the program outright, based on the assumption that flood insurance offered by private insurers would feature more accurate risk-rated premiums.⁷⁶ Within that group, some take the straightforward view that anyone who fails to secure flood insurance in

72. See, e.g., Brian Palmer, *Our National Flood Insurance Program Is Going Underwater*, NAT'L RES. DEF. COUNCIL (July 13, 2017), <https://www.nrdc.org/stories/our-national-flood-insurance-program-going-underwater> [<http://perma.cc/5TZ5-XBWG>] (“Climate change makes it increasingly urgent that we find a fix for our outdated flood insurance program.”).

73. See, e.g., Brannon & Blask, *supra* note 10 (noting that “the median value of an NFIP insured home is about twice that of American homes in general” and that “Southeast Atlantic Coast senators are sure to object to any changes that might make their constituents pay more”).

74. For example, Ike Brannon and Ari Blask are both affiliated with the right-leaning Cato Institute but have had their views on flood insurance published widely, including by the left-leaning Politico.com.

75. See sources cited *supra* note 13.

76. See BRANNON & BLASK, *supra* note 70 (“The ideal ‘reform’ to the NFIP would be to fully privatize flood insurance.”); Ben-Shahar & Logue, *supra* note 13, at 626 (calling for “ending government-run weather insurance”); Charlene Luke & Aviva Abramovsky, *Managing the Next Deluge: A Tax System Approach to Flood Insurance*, 18 CONN. INS. L.J. 1, 21–22 (2011); Kildow & Scorse, *supra* note 8; Bonnie Kristian, *The Perverse Incentives of the National Flood Insurance Program*, WEEK (Aug. 29, 2017), <https://theweek.com/articles/721185/perverse-incentives-national-flood-insurance-program> [<https://perma.cc/3PDS-42CV>]; Daniel Schwarcz, *How to Fix America's Broken Flood Insurance Scheme*, WASH. POST (Sept. 7, 2017), https://www.washingtonpost.com/opinions/how-to-fix-americas-broken-flood-insurance-scheme/2017/09/07/7cb5d2fe-93d9-11e7-aace-04b862b2b3f3_story.html [<https://perma.cc/CD8N-866W>]. Interestingly, Ben-Shahar and Logue follow their call to eliminate the NFIP by observing that the government is likely to simply replace flood insurance payments with post-disaster aid, which they call “an irresistible instinct of a decent society.” Ben-Shahar & Logue, *supra* note 13, at 625–26.

the private market (or finds it too expensive) should be simply out of luck.⁷⁷ The far more common position, recognizing the fact that a private market for flood insurance is only now beginning to emerge,⁷⁸ favors reform. To reformers there is much in the complex program that seems in need of fixing, but the overwhelming target is the NFIP's rate structure. The proposed reform is straightforward: ensure that all policyholders pay full actuarial rates, essentially reinstating Biggert-Waters.⁷⁹

Most critics of the program acknowledge that there is some subset of policyholders who would face significant financial hardship if forced to pay for flood insurance at full actuarial rates. The solution to this problem is not to retain the current system of subsidies and grandfathering, but rather to offer assistance in one form or another based on need as measured according to one of several possible variables.⁸⁰ The idea that anyone should be entitled to affordable flood insurance for any reason other than pure financial need is typically dismissed by an appeal to the concept of choice: people living in flood-prone areas have chosen to do so, and so have no claim to cheap insurance.⁸¹ A more sophisticated argument, built on the same premise and more commonly seen in academic commentary than in the popular press, is the idea that flood insurance prices can and should function as Pigouvian

77. See Kildow & Scorse, *supra* note 8 (“Homeowners and businesses should be responsible for purchasing their own flood insurance on the private market, if they can find it. If they can’t, then the market is telling them that where they live is too dangerous.”).

78. As noted above, the NFIP was created at a time when private flood insurance was non-existent. See Pasterick, *supra* note 29, at 126. Private companies have been involved in various aspects of the program since then. See *id.* at 134–35. Only recently, however, has a market for purely private flood insurance (i.e., policies written by private insurers that leave those insurers responsible for paying claims) begun to emerge. See CAROLYN KOUSKY ET AL., WHARTON RISK MGMT. & DECISION PROCESSES CTR., THE EMERGING PRIVATE RESIDENTIAL FLOOD INSURANCE MARKET IN THE UNITED STATES 1 (2018), <https://d1c25a6gwz7q5e.cloudfront.net/reports/07-13-18-Emerging%20Flood%20Insurance%20Market%20Report.pdf> [<https://perma.cc/MYC3-5WR3>]. The extent to which the private market could replace the NFIP is hotly contested and remains a somewhat theoretical question with private insurance currently representing only 3.5 to 4.5% of residential policies nationwide. *Id.* at 1–2. The best evidence appears to be that “the private sector will never be able to write policies for certain properties or locations . . . at a price homeowners would be willing to pay.” *Id.* at 2.

79. Various other shortcomings of the program will be discussed in more detail below. They include principally the idea that all of the program's rates are too low, because for various reasons it underestimates the risk its policyholders face. See *infra* Part III.B. Other more technical shortcomings that have attracted considerable attention include the underenforcement of the NFIP's purchase mandate and the underenforcement of its mitigation and adaptation requirements.

80. See BRANNON & BLASK, *supra* note 70; U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 13, at 23–25.

81. See *supra* note 8 and accompanying text.

taxes, inducing efficient precaution on the part of policyholders by forcing them to internalize the costs of their risky lifestyles.⁸² There is merit to these arguments, and they are persuasive as applied to large swaths of NFIP policyholders. But too often they are applied universally, and the premises on which they are based go unexamined.

II. ASSUMPTION OF RISK AND THE MORAL CONTENT OF INSURANCE

Making all NFIP policyholders pay full actuarial rates is not a self-justifying goal. To be sure, it would at least in theory make the program self-sufficient and thus eliminate its effect on the budget. And because the NFIP is designed as an insurance program, it is often assumed that it should function like a private insurance company and thus turn a profit, or at least break even.⁸³ But if the NFIP is seen as a program that is designed to help people manage the risk of and recover quickly from floods, a deeper question comes into focus: *should* the risk of floods be socialized? Insurance scholarship has long recognized that insurance systems can shift and spread risk in various ways. Deciding how an insurance system covering a set of risks should be designed involves evaluating a range of arguments for and against the practice of risk rating, including arguments from efficiency and arguments from fairness. The public discourse surrounding the NFIP has tended to focus on efficiency arguments at the expense of fairness arguments, and particularly the idea that people do (or do not) knowingly choose to encounter the risk of flood. The development of tort doctrine in this area suggests that this argument is only persuasive where people have subjective knowledge of the risk and a meaningful choice of whether to encounter it.

A. Individualism vs. Solidarity in Insurance Systems

Insurance systems need not be structured so that each individual policyholder bears the full magnitude of his individual risk. The “actuarial

82. See Ben-Shahar & Logue, *supra* note 13, at 575–76.

83. See Kristian, *supra* note 76 (contrasting the NFIP with a “normal insurance company,” which “would jack up the premium price to cover the high risk of floodplain construction”); Brannon & Blask, *supra* note 10 (“The NFIP’s main problem is that it doesn’t really function like private insurance.”). It is perhaps worth noting that many lines of insurance are profitable only because of the value insurance companies derive from investing their “float,” the pool of premiums the insurance company holds and draws on to pay claims. The NFIP, by contrast, has never been able to invest its float. To my knowledge, there has been no empirical study examining how much the program would have had in reserves when Hurricane Katrina struck in 2005 had it spent the previous 40 years earning a return on its float.

vision” of insurance—the idea that an insurance system ideally charges “risk-based premiums based on the best available information regarding the expected losses of the individuals insured”—is only one of several ways of seeing insurance systems.⁸⁴ This view of insurance rose to prominence in the mid-twentieth century, and supplanted earlier, more solidaristic ways of seeing insurance, typified by the fraternal insurance societies of the late nineteenth and early twentieth centuries.⁸⁵ So successful has the actuarial vision of insurance become that today, “many well-informed people would deny that it is a vision at all and assert, instead, that it is *the* model of insurance.”⁸⁶ Insurance is thus treated as a phenomenon that calls for purely economic, rather than humanistic, analysis.⁸⁷ Nevertheless, a small group of scholars from various disciplines has long insisted that insurance cannot be fully understood without examining the culture in which it exists.⁸⁸

While the actuarial model may be intellectually dominant, it has not totally supplanted other ways of structuring the insurance systems we rely on today. It is by no means the case that every form of insurance requires each policyholder to pay rates that reflect the full extent of her personal risk.⁸⁹ Put another way, insurance often contains “cross subsidies,” in which one group of policyholders pays less than actuarial rates at the expense of another group. Life insurance is probably the most “actuarial” insurance currently available, with premiums charged based on age, sex, tobacco use, and successful completion of a comprehensive health screening.⁹⁰ Individuals who purchase

84. Tom Baker & Jonathan Simon, *Embracing Risk*, in EMBRACING RISK: THE CHANGING CULTURE OF INSURANCE AND RESPONSIBILITY, *supra* note 19, at 1, 9–10.

85. See *id.* at 10; see also JOHN FABIAN WITT, *THE ACCIDENTAL REPUBLIC: CRIPPLED WORKINGMEN, DESTITUTE WIDOWS, AND THE REMAKING OF AMERICAN LAW* 209–10 (2004).

86. Baker & Simon, *supra* note 84, at 10 (emphasis in original).

87. *Id.* at 13 (“[I]nsurance has been almost completely ignored by the traditional humanities and social sciences, at least outside of economics departments and business schools. As a result, neoclassical economics is now the dominant paradigm for the analysis of insurance and risk. . . . Policy debates over the nature and extent of public insurance and the regulation of private insurance are almost always framed in economic terms.”).

88. One pioneering work in this category is ZELIZER, *supra* note 19. Zelizer, a sociologist, showed that the rise of life insurance in the early nineteenth century was largely the result of cultural forces, and particularly a shift from seeing life insurance as an immoral form of gambling on the lives of one’s family to a form of prudent savings. See *id.* at 74–102.

89. See Ronen Avraham, Kyle D. Logue & Daniel Schwarcz, *Understanding Insurance Antidiscrimination Laws*, 87 S. CAL. L. REV. 195, 235–67 (2014) (surveying and analyzing laws that prevent insurers from discriminating among insureds in pricing premiums).

90. Tom Baker, *Risk, Insurance, and the Social Construction of Responsibility*, in EMBRACING RISK: THE CHANGING CULTURE OF INSURANCE AND RESPONSIBILITY, *supra* note 19, at 33, 46 (“[T]here are great variations in the degree of solidarity insurance institutions embody. Individual life insurance, with its underwriting guidelines and risk classifications, epitomizes the individualistic end of the insurance spectrum; Social Security, with its mandatory participation

health insurance through their employers (as the majority of Americans do), by contrast, often pay rates that have little or no relationship to their individual risk.

The Affordable Care Act, in particular, reflects the judgment that individuals should not have to pay more for health insurance based on a variety of factors that affect their health risk.⁹¹ Insurers may not charge higher rates for people who are obese or diabetic or female,⁹² for example, despite the correlation between such factors and the likelihood of needing costly medical care. Indeed, the only factors insurers can use to discriminate among individual insureds in setting premiums are age (with the limitation that the premiums for older insureds be no more than three times as costly as those for younger insureds), tobacco use (with the limitation that premiums for tobacco users be no more than 1.5 times those for non-users), type of plan (individual or family), and geography.⁹³

This structure of health insurance premiums suggests a judgment that must be in large part moral.⁹⁴ Our society has decided (not without controversy, to

and income-based premiums and benefits, the solidaristic end. A health care plan with community rating (everyone pays the same premium) and open enrollment (no one is turned away) is more solidaristic than a plan that charges the sick more than the healthy and turns the riskiest applicants away.”).

91. See Jessica L. Roberts & Elizabeth Weeks Leonard, *What Is (And Isn't) Healthism?*, 50 GA. L. REV. 833, 836 (2016) (noting that “[t]he ACA notoriously prohibits private health insurers from considering individual health-risk profiles in underwriting, ratemaking, or renewals, subject to several exceptions”).

92. See 42 U.S.C. § 18116 (2018) (addressing discrimination and participation in health insurance plans funded by the federal government); *id.* § 300gg(a)(1) (enumerating the sole acceptable grounds for charging a higher rate).

93. *Id.* § 18116; see also Genetic Information Nondiscrimination Act of 2008, Pub. L. No. 110-233, §§ 101–02, 122 Stat. 881, 883, 888 (codified as amended at 29 U.S.C. § 1182(b) and 42 U.S.C. § 300gg(a)(1)(B)) (prohibiting health insurers from denying coverage or rating premiums based on genetic information).

94. See Abraham, *supra* note 19 (exploring the “moral implications” of risk classification); Avraham, Logue & Schwarcz, *supra* note 89, at 202 (describing laws limiting risk classification as presenting a tradeoff between efficiency and fairness). Indeed, a utilitarian would argue that insurance premiums should be risk-rated to the extent that the characteristics associated with higher risk are within the control of the insured and thus can be subject to a kind of Pigouvian tax, creating efficient deterrence. Having to pay higher premiums for being obese, for example, might create an incentive to lose weight (much like a soda tax). And vice versa: socializing the costs of obesity by banning its use as a factor in setting premiums creates moral hazard, incentivizing people to become obese. See Jonathan Klick & Thomas Stratmann, *Diabetes Treatments and Moral Hazard*, 50 J.L. & ECON. 519, 527–31 (2007) (arguing that mandates for medical treatment for diabetes cause people to become more obese); see also Max N. Helveston, *Consumer Protection in the Age of Big Data*, 93 WASH. U. L. REV. 859, 913 (2016) (noting that “[t]he ACA’s provisions also limit the impact that insurers’ premium setting practices will have on individuals’ personal choices”); cf. Ronen Avraham, *The Economics of Insurance Law—A*

be sure) that the healthcare costs associated with obesity or diabetes or childbearing are not to be borne exclusively by the group of people subject to those risks, and should instead be spread (or cross-subsidized). Scholarship on insurance law has identified a range of arguments that have been used to support laws against risk classification in insurance pricing.⁹⁵ Generally, arguments from efficiency favor more individualistic, actuarial ways of structuring insurance, while arguments from equity favor more solidaristic ways of structuring insurance.⁹⁶

On the efficiency side is a basket of arguments that will already be familiar from the current scholarly and popular dialogue about the NFIP, reflecting the intellectual dominance of the actuarial vision of insurance. Perhaps most prominent here is the argument that insurance premiums must be risk-rated to combat moral hazard. To put the point another way, risk-rated insurance can function as a kind of “Pigouvian tax,” forcing individuals to internalize the costs of the risks they generate and thus inducing efficient behavior.⁹⁷ In the flood insurance context, the fear is that charging lower than actuarial rates to some policyholders causes them to move to or remain in flood-prone houses. The NFIP combats moral hazard not just by charging different rates to those with different risk but also by regulating behavior through local building codes.⁹⁸

Another argument commonly used in favor of actuarial rates is adverse selection: the idea that charging relatively high rates to low-risk people will cause them to forego insurance entirely, leaving the insurance pool with an ever riskier and thus more expensive population.⁹⁹ The NFIP does have a purchase mandate, but it only applies within the 100-year floodplain, rendering it ineffective as a tool against adverse selection by lower-risk insureds.¹⁰⁰ While there are a variety of other efficiency-based arguments that are used in support of risk-based premium pricing, moral hazard and adverse selection are the two most important.¹⁰¹

Primer, 19 CONN. INS. L.J. 29, 40–41 (2012) (discussing, as an example of this phenomenon, a fire insurance premium that incentivizes investment in sprinkler systems); Avraham, Logue & Schwarcz, *supra* note 89, at 198 (noting that “risk classification by insurers can . . . create incentives for insureds to minimize risks”).

95. See, e.g., Avraham, Logue & Schwarcz, *supra* note 89; Abraham, *supra* note 19.

96. See Abraham, *supra* note 19, at 404.

97. See Ben-Shahar & Logue, *supra* note 13, at 575–76.

98. See Lemann, *supra* note 13, at 183.

99. This argument figured prominently in the design of the Affordable Care Act’s individual mandate, which was seen as necessary to combat precisely this problem.

100. See 42 U.S.C. § 4012a(b) (2018); Luke & Abramovsky, *supra* note 76, at 13–15.

101. One efficiency-based argument that is sometimes marshalled against the use of risk classification in insurance pricing is the idea that certain risky behavior generates positive

Arrayed against these arguments from efficiency is a set of arguments from equity or fairness, each of which supports laws against risk classification in insurance pricing. The most commonly advanced and important such argument in this context is the idea that people should not be punished for characteristics that are beyond their control.¹⁰² So, for example, health insurers are permitted to charge higher premiums to those who smoke, but not to women.¹⁰³ Laws against risk classification are also often justified on purely distributional grounds.¹⁰⁴ The Affordable Care Act's requirement that the elderly pay health insurance premiums no more than three times higher than the young, for instance, is a cross-subsidy from the young to the old justified at least in part on the idea that the elderly are in need of assistance.¹⁰⁵

The debate over reform of the NFIP largely ignores this "control" argument. When scholars and pundits argue that the NFIP should be reformed so that each policyholder pays full actuarial rates, they often make two assumptions. First is the assumption that the only argument *against* actuarial rates must be the redistributive argument sketched out above. Subsidized flood insurance rates have often been defended (particularly by the people paying them and their representatives in Congress) on the ground that higher rates would not be affordable and so would impose a crushing burden on those who are mandated to carry flood insurance, forcing them to move and wiping out their home equity.¹⁰⁶ Critics have made two compelling responses to this argument. First, the cross-subsidy built into the rate structure of the NFIP from those paying full actuarial rates to those paying subsidized rates is only defensible on redistributive grounds if there is in fact a correlation

externalities and so should be subsidized through cheap premiums. Avraham, Logue & Schwarcz, *supra* note 89, at 210. This argument has been made in the context of flood risk, although not in these terms or in connection with NFIP premiums per se. In the wake of Hurricane Katrina, many in New Orleans argued that the city deserved the investment the federal government was making in its recovery and continued protection because of its important role in shaping American culture. See, e.g., TOM PIAZZA, *WHY NEW ORLEANS MATTERS* (2005).

102. See Abraham, *supra* note 19, at 429 ("[R]isk classes should be based on variables that are within the control of or at least caused by the insured."); Avraham, Logue & Schwarcz, *supra* note 89, at 214–15 ("The economic costs associated with [risks that are beyond an individual's control] should be distributed in a morally blind manner.").

103. Patient Protection and Affordable Care Act, 42 U.S.C. § 18116 (2018).

104. Abraham, *supra* note 19, at 444–45.

105. See, e.g., Theodore W. Ruger, *Can a Patient-Centered Ethos Be Other-Regarding? Ought It Be?*, 45 WAKE FOREST L. REV. 1513, 1513 (2010).

106. See, e.g., Ben-Shahar & Logue, *supra* note 13, at 594 (noting that the passage of HFIAA in 2014 with broad bipartisan support was based in part on the idea that actuarial rates "burdened lower- and middle class homeowners and small businesses" (quoting 160 Cong. Rec. E309-01 (Statement of Rep. Castor))).

between flood risk and poverty. If it turned out that those paying subsidized rates were on average richer than those paying actuarial rates, the argument from affordability would be much less compelling, to put it mildly.

This empirical question has been the subject of intense debate, with different studies reaching opposite conclusions.¹⁰⁷ Providing a concrete answer has always been difficult in part because FEMA does not directly collect data on the financial status of its policyholders and in part because privacy concerns have prevented it from releasing individualized rate information that could be compared against other sources of data, like tax returns. Another challenge has been the shadow population of households who should carry flood insurance but don't.

In April of 2018, FEMA released a comprehensive report (mandated by Congress in the passage of HFIAA four years earlier) analyzing the affordability problem.¹⁰⁸ Using its own internal data on policyholders, FEMA was able to match insureds with Census data showing their income and extrapolate these matches to the full population of NFIP policyholders, obviating the need for many of the creative inferences and data techniques relied on in previous studies.¹⁰⁹ The report produced many striking findings. FEMA found that those living within flood zones tended to have lower

107. See CONG. BUDGET OFFICE, THE NATIONAL FLOOD INSURANCE PROGRAM: FINANCIAL SOUNDNESS AND AFFORDABILITY 2 (2017), <https://www.cbo.gov/system/files?file=115th-congress-2017-2018/reports/53028-nfipreport2.pdf> [<https://perma.cc/NH7V-YCZN>] (finding that NFIP policyholders tend, on average, “to live in census tracts in which median income is somewhat higher than median income averaged across all tracts”); CAMILO SARMIENTO & TED R. MILLER, PAC. INST. FOR RESEARCH & EVALUATION, COSTS AND CONSEQUENCES OF FLOODING AND THE IMPACT OF THE NATIONAL FLOOD INSURANCE PROGRAM, at xi (2006), https://biotech.law.lsu.edu/disasters/insurance/nfip_eval_costs_and_consequences.pdf [<https://perma.cc/2T5V-LCEM>] (finding that “a higher proportion of households in higher income brackets own residences in high flood risk areas near coastlines and lakes” but “low income households typically live in higher risk areas than middle income households”); Ben-Shahar & Logue, *supra* note 13, at 571 (finding “significant regressive redistribution favoring affluent homeowners” in study of coastal risk in Florida); Okmyung Bin, John Bishop & Carolyn Kousky, *Does the National Flood Insurance Program Have Redistributive Effects?*, 17 B.E. J. ECON. ANALYSIS & POL’Y, no 4, 2007 at 1, 1 (finding that “premiums as a percentage of coverage purchased are regressive” but “[p]ayouts . . . as a percentage of coverage purchased, are progressive, meaning lower-income zip codes receive a larger portion of claims paid”); Matthew E. Kahn & V. Kerry Smith, *The Affordability Goal and Prices in the National Flood Insurance Program*, (Nat’l Bureau of Econ. Research, Working Paper No. 24120, 2017) (examining flood risk along the Gulf coast and concluding that subsidized rates benefit higher income people, although this finding varies significantly by state).

108. FED. EMERGENCY MGMT. AGENCY, U.S. DEP’T OF HOMELAND SEC., AN AFFORDABILITY FRAMEWORK FOR THE NATIONAL FLOOD INSURANCE PROGRAM (2018), <https://www.fema.gov/media-library-data/1524056945852-e8db76c696cf3b7f6209e1adc4211af4/Affordability.pdf> [<https://perma.cc/L2ZD-4SLJ>].

109. *Id.* at 4.

incomes than those living outside of them.¹¹⁰ This gap is even wider if those who don't have flood insurance (but should) are included in the analysis. Within flood zones, non-policyholders have lower average incomes than policyholders, suggesting that there is a significant population of people who choose not to buy flood insurance because they cannot afford it.¹¹¹ Within flood zones, about 26% of NFIP policyholders are "low income."¹¹² More than half—about 51%—of households in flood zones that do not have flood insurance are low income.¹¹³ Notably, there is a good deal of variation in these figures. In a few states, those within flood zones tend to have higher incomes than those outside them, and in general those in coastal flood zones tend to have higher incomes than those in riverine flood zones.¹¹⁴ FEMA's analysis, thanks in part to its inclusion of households that do not have flood insurance but should, demonstrated conclusively that affordability is a major problem and that addressing it should be a significant part of any reforms to the program.

On the other hand, the focus on affordability, which could be called the redistributive argument against risk classification in flood insurance premiums, does little to support the program's current rate structure. To the extent that those who face higher risk have lower incomes, the response has always been that affordability should be addressed explicitly rather than with the patchwork rate structure that exists today. Affordability is thus seen as a concern that supports either a means-tested system for subsidized flood insurance premiums or some other form of assistance provided outside the NFIP, like a tax credit.

110. *Id.* at 11.

111. See SARMIENTO & MILLER, *supra* note 107, at 48 ("Moreover, low income homeowners generally cannot afford—and therefore lack—flood insurance.").

112. FED. EMERGENCY MGMT. AGENCY, *supra* note 108, at 6. The report's income calculations are based on HUD definitions and are relative to area median income rather than the federal poverty level. *Id.* at 12; see also UNION OF CONCERNED SCIENTISTS, UNDERWATER: RISING SEAS, CHRONIC FLOODS, AND THE IMPLICATIONS FOR U.S. COASTAL REAL ESTATE 10 (2018), <https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf> [<https://perma.cc/6BSM-K9Y5>] (noting that in many states, "60 percent or more of the homes at risk of chronic inundation over the next 30 years are valued below the state median" and highlighting flood-prone, working class communities in Massachusetts and Oregon).

113. FED. EMERGENCY MGMT. AGENCY, *supra* note 108, at 6.

114. See *id.* at 11, 14. This probably explains why some of the previous studies reached different conclusions. Many academic studies examined only particular geographic areas and only particular types of risk. Ben-Shahar and Logue, for example, studied only coastal risk in Florida, which the FEMA report shows is one of the handful of states where incomes are higher within flood zones than outside them. See FED. EMERGENCY MGMT. AGENCY, *supra* note 107, at 74; Ben-Shahar & Logue, *supra* note 13, at 590. In most parts of the country, the opposite is true.

The public discourse regarding the NFIP has given short shrift to another of the important arguments often used to support cross-subsidies in insurance pricing: the “control argument,” which holds that people should not have to bear the burden of risk factors over which they have no control. The argument could also be framed from the opposite perspective: it is unfair to force low-risk insureds to subsidize high-risk insureds when the higher risks they face are the result of their knowing and voluntary choices. This is a basic moral intuition that has had an impact on policy responses to insurance systems and risk taking in a whole range of contexts, from smoking to skiing.¹¹⁵ To those who support a fully self-sufficient NFIP that charges actuarial rates, this argument has powerful rhetorical appeal: people have chosen to expose themselves to flood risk, so they should bear the cost of it themselves.¹¹⁶

That this instinct plays a role in the way we think about flood risk can be seen in some of the existing features of the NFIP. The NFIP allows two major categories of non-actuarial rates. First, properties that existed before FEMA first mapped the risk of flood they faced (which in turn would trigger new building codes) are entitled to pay subsidized rates. In part this system was designed to attract policyholders to the program when it was first created.¹¹⁷ It also suggests a judgment that it would be unfair to force people to pay for the full magnitude of a risk they didn’t know they faced when they moved into their homes. If a property paying such rates is more than 50% damaged in a flood, it loses its entitlement to subsidized rates and must be rebuilt in compliance with building codes designed to mitigate flood risk, which usually means elevating the house.¹¹⁸ The judgment here seems to be similar: substantial damage presents the homeowner with a choice, a new opportunity to decide whether to invest in a more resilient home and face the risk or simply leave.

The second major category of subsidized rates is paid by properties whose risk has increased because of a revision in one of FEMA’s maps. When FEMA releases new maps that show a property in a higher risk zone than it was before, that property can pay “grandfathered” rates dictated by the old map.¹¹⁹ In part, this category of subsidized rates was created to mitigate local

115. See Abraham, *supra* note 19, at 429; see also Ben-Shahar & Logue, *supra* note 13, at 594 (“Actuarial fairness has an intuitive appeal, for example, when differences in risks are the result of individuals’ voluntary choices. It seems fair that smokers should pay higher life and health insurance premiums than nonsmokers, and that aggressive drivers pay higher auto insurance premiums.”).

116. See *supra* note 8 and accompanying text.

117. See Pasterick, *supra* note 29, at 132–34.

118. See *id.* at 144.

119. U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 13, at 7.

opposition to the periodic adoption of revised flood maps¹²⁰ (which is often, nevertheless, quite intense¹²¹). But again, the judgment appears to be in part a moral one as well: People should be responsible only for the measure of risk they chose or, to put it another way, should not be forced to bear the full burden of higher rates when FEMA determines that the flood risk they face was actually significantly higher than they thought it was when they moved in.

It is thus wrong to assume that the NFIP must necessarily be a fully self-sustaining program, or that the only way to make it self-sustaining is for each individual policyholder to pay full actuarial rates. Indeed, as the Government Accountability Office has noted (perhaps critically), the NFIP was “not designed to be actuarially sound in the aggregate, nor was it intended to generate sufficient funds to fully cover all losses.”¹²² The NFIP can be (indeed, has been) designed to function in part as a subsidy from taxpayers to flood victims. It is this subsidy that has made the program deeply controversial, but the subsidy’s moral premises have rarely been examined. Further, as insurance scholars have noted and as can be seen in other, more solidaristic forms of insurance that remain significant today, insurance systems can be self-sustaining and include cross-subsidies from various classes of policyholders to others. Just as the young subsidize the old when buying health insurance, those who pay full-priced rates for flood insurance subsidize those who pay discounted rates. The justifiability of the program as a system of incentives has been rightly questioned; what has received less attention are its moral justifications.

B. *Assumption of Risk*

If the choice to encounter a risk affects where responsibility for that risk should lie, what does it mean to choose a risk? It is typically assumed that people who are flooded have made a morally significant choice to expose themselves to that risk, but there is a difference, long discussed in tort doctrine and tort theory, between the purely formal illusion of choice and a knowing, free choice sufficient to create responsibility for the realization of a risk. By importing a more sophisticated understanding of tort doctrine into this admittedly non-tort context, the argument that people living in risky locations have assumed the risk of flooding can be evaluated in a more

120. CONG. BUDGET OFFICE, *supra* note 107, at 16.

121. See Sarah Pralle, *Drawing Lines: FEMA and the Politics of Mapping Flood Zones* 3–4 (2017) (unpublished manuscript), https://www.maxwell.syr.edu/uploadedFiles/faculty/psc/Pralle_Drawing%20Lines_APSA2017.pdf [<https://perma.cc/KU22-ZAL9>].

122. HIGH RISK SERIES, *supra* note 69, at 619.

nuanced way. Looking at the argument in light of tort doctrine on assumption of risk suggests many contexts in which it is persuasive—and others in which it is not. If tort law represents a distillation and application of our common moral intuitions about risk and responsibility, it can shed light on how this complex problem should be resolved.

Tort law adds to the debate two key ideas that have thus far been largely absent. First is an insistence on a more nuanced understanding of the concept of choice. While early assumption-of-risk cases were content to treat any action not literally coerced as an exercise of the plaintiff's free will, courts in the second half of the twentieth century began to understand that economic and social pressures could induce someone to remain in a job, say, despite being uncomfortable about the hazards they might face there. Second, tort law emphasizes the plaintiff's subjective knowledge of the risk he or she faced.¹²³ Only rarely and in limited ways have any of these ideas played a role in our discourse regarding flood risk.

Assumption of risk was introduced to American courts in 1859 with the publication of Francis Hilliard's treatise on tort law.¹²⁴ While Hilliard tied the idea to the relationship between "master" and "servant" in a way that suggested applicability only to workplace injuries, the doctrine soon spread to other contexts.¹²⁵ By 1878, a treatise on negligence could describe assumption of risk as the expression of the "general principle that a party cannot recover for injury he incurs in risks, themselves legitimate, to which he intelligently submits himself."¹²⁶

Two famous decisions from the early twentieth century illustrate the promise and peril of assumption of risk, and give a sense of why it remains

123. See, e.g., *D'Andrea v. Sears, Roebuck & Co.*, 287 A.2d 629, 633 (R.I. 1972) (rejecting defendant's argument that it was entitled to an assumption of risk instruction where plaintiff employee "should have known" of the danger of falling off a loading platform because "a plaintiff is not deemed to have assumed the risk of conditions of which he is ignorant," a standard that "is subjective and is keyed to what the particular plaintiff in fact sees, knows, understands and appreciates" (internal quotations omitted)). But see *Murray v. Ramada Inns, Inc.*, 521 So. 2d 1123, 1130–31 (La. 1988) (noting that "even as we held that assumption of risk involves a purely subjective standard and turns on whether the plaintiff actually knew of the risk, we were willing to impute such knowledge to the plaintiff whenever it could be assumed from the given facts that he must have known of the danger").

124. See Eric A. Feldman & Alison Stein, *Assuming the Risk: Tort Law, Policy, and Politics on the Slippery Slope*, 59 DEPAUL L. REV. 259, 267 (2010).

125. *Id.* (noting that Hilliard describes the doctrine as holding that "[i]f a defective condition 'was known to the servant . . . and the servant continued in the service he assumed the risk himself.'") (quoting 2 FRANCIS HILLIARD, *THE LAW OF TORTS, OR PRIVATE WRONGS* 467 (3d ed. 1866)).

126. *Id.* (quoting FRANCIS WHARTON, *A TREATISE ON THE LAW OF NEGLIGENCE* 181 (2d ed. 1878)).

controversial both doctrinally and normatively. *Murphy v. Steeplechase Amusement Co.* involved a young man who had broken his kneecap on a Coney Island amusement park ride called “the flopper.”¹²⁷ In an elegantly terse but somewhat cryptic opinion by Judge Cardozo, the New York Court of Appeals held that the plaintiff had assumed the risk of being thrown to the ground when he stepped onto the ride. He had watched numerous other riders suffer the same fate and indeed being thrown to the ground against or at least in the company of a lady friend was in a sense the whole point of the enterprise.¹²⁸ “*Volenti non fit injuria*,”¹²⁹ Cardozo wrote:

One who takes part in such a sport accepts the dangers that inhere in it so far as they are obvious and necessary Visitors were tumbling about the belt to the merriment of onlookers when he made his choice to join them. He took the chance of a like fate, with whatever damage to his body might ensue from such a fall. The timorous may stay at home.¹³⁰

Much of the language in Cardozo’s opinion can be read as holding, contrary to the famous quote above, that the company was not in fact negligent in designing the ride. The chance of being thrown was part of the point, and the canvas pads placed to the side of the belt were adequate provision for riders’ safety. There is thus some confusion as to whether the opinion is best read as only holding that a plaintiff assumes the risk of an activity when the risk is in some sense the very point of the activity (and thus not properly described as stemming from any negligence on the part of the defendant). This formulation would later be referred to by some courts as “primary” assumption of risk, with “secondary” assumption of risk being the more expansive idea that a plaintiff who knowingly and voluntarily encounters a risk created by the defendant’s negligence is barred from recovery.¹³¹ Regardless of its precise interpretation as a doctrinal matter, *Murphy* stands out as an expression of a common moral instinct: a person

127. 166 N.E. 173 (N.Y. 1929).

128. See *id.* at 174. The plaintiff, “a vigorous young man,” was at the park with friends and had just watched one of them, “a young woman, now his wife,” step onto the belt before him. *Id.* When the belt gave a sudden jerk, the whole group was thrown to the floor. *Id.* Cardozo opines that “[t]he tumbling bodies and the screams and laughter supplied the merriment and fun.” *Id.*

129. “To a willing person it is not a wrong,” i.e., “a person is not wronged by that to which he or she consents.” *Volenti non fit injuria*, BLACK’S LAW DICTIONARY (10th ed. 2014).

130. 166 N.E. at 174.

131. See *Knight v. Jewett*, 834 P.2d 696, 703–04 (Cal. 1992).

who knowingly and voluntarily chooses to expose himself to a risk thereby accepts responsibility for its realization.¹³²

The perhaps equally famous Holmes opinion in *Lamson v. American Axe*¹³³ illustrates well why assumption of risk has long been deeply controversial. Lamson was an employee of an axe manufacturer who expressed concern to his employer about the stability of a rack full of hatchets and the safety of working beneath it.¹³⁴ The response from Lamson's boss was straightforward: "use the racks or leave."¹³⁵ Lamson chose not to quit his job and, as he feared, was injured by a falling hatchet. Holmes's two paragraph opinion had no difficulty concluding that Lamson "took the risk": "The plaintiff, on his own evidence, appreciated the danger more than anyone else. He perfectly understood what was likely to happen."¹³⁶ The fact that "the fear of losing his place was one of his motives" in staying was dismissed as simply irrelevant.¹³⁷

Lamson shows how assumption of risk became a key member of the so-called "unholy trinity" of tort doctrines that served to block recovery by workers for workplace injuries in the late nineteenth and early twentieth centuries.¹³⁸ That legacy has made assumption of risk deeply controversial as a normative matter. By adopting an expansive conception of "choice" and treating the choices made by plaintiffs from all walks of life and in all contexts equally, this traditional version of assumption of risk instantiates a laissez-faire vision of the world that is "rooted in an unattractive libertarian conception of equality."¹³⁹ Many have even seen it as a wholly unprincipled subsidy to American industry.¹⁴⁰ Notably, Holmes's opinion completely

132. See Feldman & Stein, *supra* note 124, at 300 (noting the "powerful intuitive appeal to the idea that individuals who engage in risky activities should bear the costs of their accidents").

133. *Lamson v. Am. Axe & Tool Co.*, 58 N.E. 585 (Mass. 1900).

134. See *id.* at 585.

135. *Id.*

136. *Id.*

137. *Id.*

138. WILLIAM L. PROSSER, *HANDBOOK OF THE LAW OF TORTS* 526–27 (4th ed. 1971); see also LAWRENCE M. FRIEDMAN, *A HISTORY OF AMERICAN LAW* 470–85 (2d ed. 1985); WITT, *supra* note 85, at 43–70.

139. Avihay Dorfman, *Assumption of Risk, After All*, 15 *THEORETICAL INQUIRIES* L. 293, 296 (2014).

140. See *Tiller v. Atl. Coast Line R.R. Co.*, 318 U.S. 54, 58–59 (1943) ("Assumption of risk is a judicially created rule which was developed in response to the general impulse of common law courts at the beginning of [the industrial revolution] to insulate the employer as much as possible from bearing the 'human overhead' which is an inevitable part of the cost—to someone—of the doing of industrialized business. The general purpose behind this development in the common law seems to have been to give maximum freedom to expanding industry."); *id.* at 69 (Frankfurter, J., concurring) ("[T]he phrase 'assumption of risk' gave judicial expression to

elides the economic context in which Lamson's choice to keep his job was made. For Holmes, the choice to remain in a job was no different from the choice to step onto a frivolous ride like the flopper. By treating the choices of everyone in every context as equal doctrinally, assumption of risk ironically "betray[ed] the basic commitment to the equal concern and respect for persons" that is, at least today, usually taken as basic to both tort law and our legal system more broadly.¹⁴¹

Perhaps motivated by the idea that assumption of risk "threatens too much libertarianism and too little fairness" (which Avihay Dorfman calls "the deep source of the hostility toward the assumption of risk doctrine"),¹⁴² scholars and judges have long sought to abolish assumption of risk on doctrinal grounds as well. One version of this effort focuses on the ways in which assumption of risk analysis often feels suspiciously like a substitute for ideas concerning duty or breach or comparative negligence. Assumption of risk can thus be seen as redundant; instead of saying the plaintiff assumed the risk and therefore loses, this critique says, we should be saying that the defendant lacked a duty to prevent this particular harm, or that the defendant's behavior did not breach a duty he owed the plaintiff, or that the plaintiff was actually negligent in exposing himself to the risk.

The problem, on this view, is not just that it is unnecessary to talk about assumption of risk, but rather that talking about it distracts us from the real issues.¹⁴³ For example, did the Steeplechase Amusement Park in fact operate a dangerous ride, or was Murphy's accident best characterized as a freak occurrence not traceable to any breach on the part of the defendant? If the problem is that amusement park rides should be reasonably safe, then talking about whether Murphy assumed the risk begins to look like a distraction. Modern conventional wisdom among torts scholars holds that assumption of

a social policy that entailed much human misery."); *Lyons v. Redding Constr. Co.*, 515 P.2d 821, 823 (Wash. 1973) (tracing assumption of risk to "[j]udicial protectivism of industrial growth" and noting that "[j]udicial recognition that industry should not be nurtured at the expense of human suffering was not forthcoming until relatively recently").

141. Dorfman, *supra* note 139, at 309. Even Francis Bohlen, an early booster of the assumption of risk doctrine, sounded a note of caution about its ability to "impose an intolerable subjection to fortuitous advantages of superior physical, social, and economic position," which could be "abused to obtain the mere form of consent while the substance of real volition is absent." Francis H. Bohlen, *Voluntary Assumption of Risk*, 20 HARV. L. REV. 14, 21–22 (1906). Nevertheless, Bohlen insisted that "the common law makes no pretence of being a social reformer, and does not profess to reduce all persons to an absolutely equal position by eliminating natural advantages." *Id.* at 22.

142. Dorfman, *supra* note 139, at 308.

143. See, e.g., Stephen D. Sugarman, *The Monsanto Lecture: Assumption of Risk*, 31 VAL. U. L. REV. 833 (1997).

risk should be abolished as a distinct doctrine and assimilated within comparative fault.¹⁴⁴ The Third Restatement of Torts favors this approach as well, suggesting that the plaintiff's choice to encounter a risk should be treated as relevant only to the question of breach.¹⁴⁵

And yet, assumption of risk remains "firmly embedded in tort law."¹⁴⁶ In part there is a narrow doctrinal explanation. There is, technically at least, a meaningful distinction between holding that an individual plaintiff subjectively appreciated a risk and chose to expose herself to it and a holding that relies on notions of duty or reasonable care.¹⁴⁷ Indeed, many courts applying the doctrine of assumption of risk interpret the subjective knowledge requirement quite strictly, rejecting arguments that plaintiffs ought to have known of the risk that led to their injury.¹⁴⁸ Some courts considering the impact of the move from contributory to comparative negligence on assumption of risk have thus concluded that assumption of risk should continue to operate as a complete bar to a plaintiff's recovery.¹⁴⁹

144. See, e.g., KENNETH S. ABRAHAM, *THE FORMS AND FUNCTIONS OF TORT LAW* 153 (2d ed. 2002); DAN B. DOBBS, *THE LAW OF TORTS* 534–46 (2000); FOWLER V. HARPER ET AL., *THE LAW OF TORTS* § 21.8 (2d ed. 1986); Fleming James Jr., *Assumption of Risk*, 61 *YALE L.J.* 141 (1952); Sugarman, *supra* note 143; John W. Wade, *The Place of Assumption of Risk in the Law of Negligence*, 22 *LA. L. REV.* 5, 14 (1961).

145. RESTATEMENT (THIRD) OF TORTS: APPOINTMENT OF LIABILITY § 3 cmt. c (AM. LAW INST. 2000).

146. Feldman & Stein, *supra* note 124, at 302.

147. See PROSSER, *supra* note 138, § 68 (insisting that assumption of risk "is a distinctive kind of contributory negligence . . . governed by the subjective standard of the plaintiff himself [and not] the objective standard of the reasonable man"); Dorfman, *supra* note 139, at 300; see also *Poole v. Coakley & Williams Constr., Inc.*, 31 A.3d 212 (Md. 2011) (distinguishing assumption of risk from contributory negligence).

148. See, e.g., *Poole*, 31 A.3d at 228 (rejecting argument that risk of slipping on black ice was obvious to plaintiff crossing a visibly icy parking lot); *Hughes v. Omaha Pub. Power Dist.*, 735 N.W.2d 793, 810–11 (Neb. 2007) (holding that reasonable jury could conclude that plaintiff who was cutting through conduit in an area marked as containing buried electrical lines did not have actual knowledge of the danger associated with the particular excavation site in question); *Pliess v. Barnes*, 619 N.W.2d 825, 829–30 (Neb. 2000) (holding that the plaintiff's admitted appreciation of the general risk that ladders could "get shaky and fall down" not sufficient to show assumption of risk that aluminum ladder could slide when placed against aluminum gutter); *Vaughn v. Pleasant*, 471 S.E.2d 866, 869 (Ga. 1996) (holding that the plaintiff, a police officer engaged in a high-speed pursuit who sped through an intersection in the wrong lane, did not thereby assume the risk of a collision. While plaintiff was aware of the general risk of speeding through intersections, he was not aware of the specific risk created when defendant, pulling a trailer with non-functioning lights, made an unexpected left turn.).

149. See, e.g., *Smollett v. Skayting Dev. Corp.*, 793 F.2d 547, 548 (3d Cir. 1986); *Kennedy v. Providence Hockey Club, Inc.*, 376 A.2d 329 (R.I. 1977). Other jurisdictions have adopted a contrary rule. See, e.g., *Li v. Yellow Cab Co.*, 532 P.2d 1226 (Cal. 1975); *McConville v. State Farm Mut. Auto. Ins. Co.*, 113 N.W.2d 14 (Wis. 1962).

Assumption of risk has also been narrowed significantly since the days of *Lamson*. Today, courts are much more willing to treat as not sufficiently “voluntary” choices like the decision to remain in a job.¹⁵⁰

These narrow doctrinal explanations, however, hint at a broader, more significant truth: assumption of risk is popular. Contrary to the views of many legal scholars and jurists, assumption of risk contains at its core an idea that has appealing normative meaning independent of concepts of duty and breach.¹⁵¹ Pitched at its highest level of generalization, assumption of risk expresses in doctrine the commonsense idea that someone who knowingly and freely exposes himself to a risk cannot then complain when that risk is realized.¹⁵² Framed this way, assumption of risk survives even in jurisdictions that have abolished it as a total bar to a plaintiff’s recovery; even under the Third Restatement approach, for example, a defendant may still argue that the plaintiff’s knowing and freely made choice to encounter a risk diminishes the defendant’s own responsibility for the plaintiff’s injury, either because the plaintiff’s decision was itself negligent or because it renders the defendant’s behavior less so.¹⁵³

Nor is assumption of risk the only tort doctrine that hinges on concepts of knowledge and choice. Consent, for example, is an affirmative defense to a broad range of intentional torts, from battery to trespass to false imprisonment.¹⁵⁴ Like assumption of risk, consent is built on ideas about individuals’ right to autonomy.¹⁵⁵ Consent is thus inherently subjective; it is irrelevant whether a reasonable person would have consented in similar

150. See *Siragusa v. Swedish Hospital*, 373 P.2d 767, 773 (Wash. 1962) (“To bar recovery when the employee is acting reasonably in exposing himself to a known and appreciated risk is to indulge in the unrealistic and rigid presumption that, in so exposing himself, the employee ‘assents’ to relieve his employer from his responsibility to furnish a safe place in which to work. Such a presumption has no basis in experience, and is not founded upon any current social policy.”); Kenneth W. Simmons, *Reflections on Assumption of Risk*, 50 UCLA L. REV. 481, 485 (2002).

151. See John C.P. Goldberg & Benjamin C. Zipursky, *Shielding Duty: How Attending to Assumption of Risk, Attractive Nuisance, and Other “Quaint” Doctrines Can Improve Decisionmaking in Negligence Cases*, 79 S. CAL. L. REV. 329 (2006); Simmons, *supra* note 150, at 481, 528.

152. See Feldman & Stein, *supra* note 124, at 300–02 (noting that assumption of risk “has withstood decades of criticism because of its resonance with society”).

153. RESTATEMENT (THIRD) OF TORTS: APPORTIONMENT OF LIABILITY § 3 cmt. c (AM. LAW INST. 2000) (“Abandoning implied assumption of risk as a defense does not mean that a plaintiff’s actual knowledge of or voluntary decision to encounter a risk is irrelevant to apportioning liability.”).

154. DOBBS, *supra* note 144, § 105.

155. *Id.* (noting that consent “makes the plaintiff’s right of self-determination or autonomy the centerpiece of the law on intentional torts and to some extent other torts as well”).

circumstances.¹⁵⁶ Consent is also ineffective to bar recovery if it is based on a mistake (for example as a result of a misrepresentation by the defendant)¹⁵⁷ or obtained by duress (for example through an employer's abuse of his position of power of an employee).¹⁵⁸ These concepts are analogous to assumption of risk's focus on knowledge and choice. In both cases tort law respects the exercise of an individual's free will to the extent that it is based on an accurate understanding of the factual circumstances and is not coerced.

In addition to surviving as a tort doctrine (and being given effect by countless jury decisions), assumption of risk crops up as an argument in numerous policy debates outside the realm of tort law. In contexts ranging from obesity¹⁵⁹ to tobacco¹⁶⁰ to the perils of a career playing professional football,¹⁶¹ the argument is often made that people should be afforded the freedom to expose themselves to various risks, and to live with the consequences. The ubiquity of this argument is a sign of its power, and it behooves those who are skeptical of it to take it seriously.¹⁶²

III. KNOWLEDGE

For a choice to live somewhere to be a morally significant factor in evaluating one's responsibility for the risks one faces there, that choice must be made knowingly, with some particularized awareness of the risk. While the current discourse surrounding reform of the NFIP frequently assumes that people know the risk of flooding they face, a closer examination reveals that this assumption is largely false. Knowledge of risk results from (1) scientific understanding of the risk; (2) communication of the scientific understanding to individuals; and (3) comprehension on the part of individuals. There are, in many cases, nearly insurmountable obstacles at each stage of this process.

156. On the other hand, a plaintiff can consent by words or acts the defendant reasonably interpreted to manifest consent, even if the plaintiff did not subjectively intend to consent. *Id.* § 105.

157. *Id.* § 112.

158. *Id.* § 113.

159. See, e.g., Richard A. Epstein, *What (Not) To Do About Obesity: A Moderate Aristotelian Answer*, 93 GEO. L.J. 1361, 1361–62 (2005).

160. See, e.g., Jon D. Hanson & Kyle D. Logue, *The Costs of Cigarettes: The Economic Case for Ex Post Incentive-Based Regulation*, 107 YALE L.J. 1163, 1183–86, 1319 (1998) (noting prominence of assumption of risk argument in debate over tobacco regulation).

161. See, e.g., Mikayla Paolini, Comment, *NFL Takes a Page from the Big Tobacco Playbook: Assumption of Risk in the CTE Crisis*, 68 EMORY L.J. 607, 628–30 (2019).

162. Dorfman, *supra* note 139, at 310–11 (“The challenge for those seeking to invoke the law to make our society healthier and safer for all is to engage, rather than dismiss or ignore, the conservative instinct for the assumption of risk (moral) principle and (legal) doctrine.”).

A. *The Science of Flood Risk*

To understand the risk of flood faced by an individual parcel of land is an enormously complicated undertaking. It is worth remembering that one reason private insurers stopped offering flood insurance in the mid twentieth century was that they were simply unable to adequately model the risk.¹⁶³ Although the science of hydrology has made enormous progress, scientists continue to work to refine their understanding of how a myriad of factors come together to affect the flood risk in any particular location, and how those factors might change in the future.

A flood is a combination of water and land, and predicting one requires a sophisticated understanding of each. The water that creates a flood can come from intense rainfall, coastal storm surge, a river overtopping its banks, or any combination of these. How that water impacts the land in question can also be determined by a range of factors, including soil composition, local topography, development patterns, and the design of any home that is affected. Processing all of these factors requires gathering large volumes of accurate data, which has proved to be a significant challenge.¹⁶⁴

Flood risk is very much a moving target; each of these factors is subject to change, often with devastating effects. In May of 2018, Ellicott City, Maryland, was hit by devastating flooding. Thanks to videos taken and posted to social media by terrified residents watching from second story windows as their downtown turned into a roiling river of brown floodwater, the event briefly captured widespread attention.¹⁶⁵ To locals, the flood was notable not just for its magnitude, but because it was the second 1,000-year flood (a flood with a 0.1% chance of occurring in any given year) in three years.¹⁶⁶ Ellicott City is an old mill town. It was founded in 1772 and has flooded over a dozen

163. See Pasterick, *supra* note 29, at 128; Scales, *supra* note 13, at 8.

164. See Alexandra Witze, *Attack of the Extreme Floods*, NATURE (Mar. 7, 2018), <https://www.nature.com/articles/d41586-018-02745-0> [https://perma.cc/AS9M-T2WW] (describing efforts by scientists to gather data on flood risk, including need to manually collect and digitize documents that predate the start of modern NOAA records in 1921); see also Maggie Koerth-Baker, *It's Time To Ditch the Concept of '100-Year Floods,'* FIVETHIRTYEIGHT (Aug. 30, 2017), <https://fivethirtyeight.com/features/its-time-to-ditch-the-concept-of-100-year-floods/> [https://perma.cc/N8TM-22DV] (noting that much of the stream gauge data on which estimates of Houston's flood risk is based only goes back a few decades).

165. See Henry Grabar, *The Maryland Flooding Is a Warning: Climate Change Is Hitting America as Rain, and We're Making It Worse*, SLATE (May 29, 2018), <https://slate.com/news-and-politics/2018/05/ellicott-city-maryland-flooding-climate-change-is-coming-as-rain.html> [https://perma.cc/J4XW-ARLQ].

166. *Id.* That this is startling is, in part, a perfect illustration of the problem of describing flood events by their "return interval," which tends to create an impression that a 1,000-year flood should happen only once in 1,000 years.

times since then. The source of its floodwaters has historically been the Patapsco River, which flows into Baltimore and forms its harbor. The flood events of 2016 and 2018, however, resulted from flash floods on the Tiber River, a small tributary of the Patapsco that flows through Ellicott City. The surrounding area has seen widespread development in recent years, which has covered absorbent soil with asphalt and created a flash flooding problem that most agree is new.¹⁶⁷

The flooding in Ellicott City points to another significant challenge in the scientific understanding of flood risk: the role of climate change. Ellicott City's flooding was caused by a brief but intense period of rainfall, one of several sources of flooding that climate change is expected to exacerbate. Warmer air holds more moisture, which can cause heavier rainfall. The number of extreme precipitation events in the United States has been well above average for the past three decades, a trend that is expected to continue.¹⁶⁸ Understanding how these broad trends apply to any given place in the United States is much more challenging. The first volume of the Fourth National Climate Assessment notes that the observed national increase in extreme precipitation masks significant regional and seasonal variations: the Pacific Northwest has seen a slight decrease in extreme rainfall, while the eastern half of the country has seen large increases.¹⁶⁹ Projecting these trends into the future, the Climate Assessment notes, is "much more difficult."¹⁷⁰ While the global mechanisms are fairly well understood, how they will play out in a particular region is a matter of uncertainty.¹⁷¹ The degree of uncertainty is worth emphasizing. How much increase in extreme precipitation events is expected over the coming century depends on trends in carbon emissions during that period, itself a matter of significant uncertainty.¹⁷² If carbon emissions continue to increase, the number of extreme rainfall events in the United States could increase by anywhere from

167. See *id.*; Luke Broadwater, Scott Dance & Pamela Wood, *After Deadly Flash Flood, Concern About Development's Impact on Ellicott City*, BALT. SUN (Aug. 13, 2016), <http://www.baltimoresun.com/news/maryland/howard/ellicott-city/bs-md-ho-ellicott-city-development-20160813-story.html> [<https://perma.cc/A36J-A9XR>]. Nowhere is this dynamic more pronounced than in Houston. Satija, Collier & Shaw, *supra* note 5.

168. 1 U.S. GLOB. CLIMATE CHANGE RESEARCH PROGRAM, CLIMATE SCIENCE SPECIAL REPORT: THE FOURTH NATIONAL CLIMATE ASSESSMENT 210, 216 (Donald J. Wuebbles, David W. Fahey & Kathy W. Hibbard eds., 2017), https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf [<https://perma.cc/JB69-K6MS>].

169. *Id.* at 210–13.

170. *Id.* at 216.

171. *Id.*

172. *Id.* at 14, 218.

100 to 200%.¹⁷³ Under a lower emissions scenario, increases could be between 50 and 100%, again with significant regional variation.¹⁷⁴

A far more significant way in which climate change will increase flood risk is sea level rise. A higher global sea level will worsen periodic flooding from storm surges, so-called “nuisance” flooding that occurs during high tides, and finally, in some areas, lead to complete inundation. Rising sea levels are frequently assumed to present an obvious and unmistakable risk for those in coastal areas, but here again the risk is characterized by complexity and variability that makes its application to individual properties challenging.

The scientific understanding of how rising sea levels will affect flood risk must start with a basic question: how much will global sea levels increase? Translating degrees of warming in the earth’s climate into increases in global mean sea level requires starting with assumptions about how much warming will occur. The national climate assessment bases its analysis on the amount of warming that will occur by 2100 under four possible scenarios: a pessimistic scenario in which emissions continue at current rates, and three more optimistic scenarios that assume varying degrees of reduction in emissions at various times.¹⁷⁵ Under these scenarios, which were generated for the Intergovernmental Panel on Climate Change, warming could range from as little as 0.6 to 2.4 degrees Celsius under the lowest scenario to as much as 2.8 to 5.7 degrees Celsius under the highest scenario.¹⁷⁶

These ranges translate into similarly broad ranges of possible increases in global sea levels.¹⁷⁷ The fourth national climate assessment predicts that global mean sea level will rise by at least a foot by 2100, and goes on to note that under a high emissions scenario, global sea levels could rise by as much as eight feet, but that “the probability of such an extreme outcome cannot currently be assessed.”¹⁷⁸

Increases in global mean sea level do not translate into uniform increases in regional sea levels. Regional sea level is affected by a range of factors,

173. *Id.* at 218.

174. *Id.*

175. *Id.* at 16.

176. *Id.* These estimates have generated intense debate. Many scientists believe they are too low. The former chair of the Intergovernmental Panel on Climate Change, Robert Watson, has said that warming of three degrees should be considered the “realistic minimum.” Nathaniel Rich, *Losing Earth: The Decade We Almost Stopped Climate Change*, N.Y. TIMES (Aug. 1, 2018), <https://nyti.ms/2mWMDT8> [<https://perma.cc/4CFT-JUAN>].

177. See UNION OF CONCERNED SCIENTISTS, *supra* note 112, at 11 (“The difference in impacts to real estate between high and low sea level rise scenarios is stark.”).

178. U.S. GLOB. CLIMATE CHANGE RESEARCH PROGRAM, *supra* note 168, at 333.

including global ocean currents and land subsidence.¹⁷⁹ While this introduces further uncertainty into localized predictions (for example, the Gulf Stream has been weakening and could collapse entirely, significantly worsening sea level rise along the East Coast),¹⁸⁰ it is so far clear that much of the east and Gulf coasts of the United States will experience sea level rise worse than global averages.¹⁸¹ Indeed, this trend has already begun and has been observed in local data.¹⁸²

Such is the current state of scientific understanding of how climate change will affect flood risk in the United States.¹⁸³ It will certainly worsen the risk of flooding in most areas, but to highly varying degrees depending on factors ranging from global efforts to curb carbon emissions to local groundwater extraction and land use patterns.

B. FEMA's Understanding of Flood Risk

FEMA's understanding of flood risk is what matters for purposes of the NFIP, and it diverges from what might be called the best scientific understanding in a variety of ways. First and perhaps most glaringly, FEMA's estimates of flood risk are exclusively backwards-looking. In other words, FEMA does not account for projections of future increases in rainfall or sea level in evaluating flood risk. It also doesn't factor in future land subsidence or development. In FEMA's most recent report to Congress, this is listed as a long term, "10+ year[]" goal.¹⁸⁴ FEMA is also cautious about incorporating new data and new modelling techniques into its assessments of flood risk, which inevitably leaves it trailing behind the latest science. One recent study,

179. *Id.* at 335. In some areas, the earth's crust is still moving upwards ("rebounding") after being relieved of the weight of the ice sheets that rested on it during the last ice age. In other areas, land deposited by glaciers is still subsiding.

180. *Id.* at 335, 346.

181. *Id.*

182. *Id.* at 347.

183. In emphasizing the uncertainty in scientific projections of flood risk, I do not wish to deny or even downplay the significance of the risks involved, or, obviously, the degree to which human activity has contributed to those risks and the desirability of efforts to address them. My point is that the current scientific understanding of how climate change will affect flood risk is phrased in terms of ranges of possibilities that apply to vast regions of the country, which makes the task of understanding how an individual property's flood risk will change over the coming century necessarily imprecise.

184. DEP'T. OF HOMELAND SEC., FEMA REPORT TO CONGRESS ON THE TECHNICAL MAPPING ADVISORY COUNCIL'S RECOMMENDATIONS FROM 2015, at 17 (2017), [https://www.fema.gov/media-library-data/1510597855001-1e4586a3b443a444399889cdd205663c/FEMA_Administrator_Report_to_Congress_\(June_9_2017\)_TMAC_Recomm.pdf](https://www.fema.gov/media-library-data/1510597855001-1e4586a3b443a444399889cdd205663c/FEMA_Administrator_Report_to_Congress_(June_9_2017)_TMAC_Recomm.pdf) [https://perma.cc/8KRQ-5PLV].

for example, noted that FEMA assesses the risk of freshwater and saltwater flooding as entirely independent variables, when in fact they often appear together, as happens during hurricanes.¹⁸⁵

Perhaps even more significantly, FEMA's flood maps are appallingly old, and out of date even by its own internal yardstick. Keeping detailed flood maps of the entire country up to date has been a challenge that has bedeviled FEMA for years. In the National Flood Insurance Reform Act of 1994, Congress required FEMA to assess each of its flood maps every five years and determine whether each map is in need of revision. In 2009, FEMA set itself a goal ensuring that 80% of its maps were either revised and updated or determined to be accurate by 2014. Instead only 49% of its maps met this standard by 2014. A 2017 report by the Department of Homeland Security's Inspector General revealed that by the end of December 2016, only 42% of FEMA's maps were up to date.¹⁸⁶

In many parts of the country, including parts that are at high risk of flooding, maps are decades old.¹⁸⁷ Beaufort and Hilton Head, South Carolina, have not had new flood maps since 1986. Parts of the Texas Gulf Coast near Houston and Galveston have not had new maps since the early 1990s.¹⁸⁸ Atlantic City, New Jersey, which is already experiencing regular nuisance flooding due to rising sea levels,¹⁸⁹ has not had a new flood map since 1985.¹⁹⁰ In many areas the difference between old and new maps is significant: flood maps for Jackson County, Mississippi, (along the Gulf Coast) show water depths during a 100-year flood as much as fourteen feet higher than older

185. See Jen Schwartz, *National Flood Insurance Program Is Underwater Because of Outdated Science*, SCI. AM. (Mar. 23, 2018), <https://www.scientificamerican.com/article/national-flood-insurance-is-underwater-because-of-outdated-science> [https://perma.cc/W9RL-SAHB].

186. OFFICE OF THE INSPECTOR GEN., U.S. DEP'T. OF HOMELAND SEC., OIG-17-110, FEMA NEEDS TO IMPROVE MANAGEMENT OF ITS FLOOD MAPPING PROGRAMS 3 (2017), <https://www.oig.dhs.gov/sites/default/files/assets/2017/OIG-17-110-Sep17.pdf> [https://perma.cc/F2XN-XDF4].

187. See Michael Keller et al., *Outdated and Unreliable: FEMA's Faulty Flood Maps Put Homeowners at Risk*, BLOOMBERG (Oct. 6, 2017), <https://www.bloomberg.com/graphics/2017-fema-faulty-flood-maps> [https://web.archive.org/web/20190119221018/https://www.bloomberg.com/graphics/2017-fema-faulty-flood-maps/].

188. *Id.*

189. Michael Edison Hayden, *Atlantic City Gambles on Rising Seas*, NAT'L GEOGRAPHIC (May 4, 2016), <http://news.nationalgeographic.com/2016/05/160502-rising-seas-climate-change-atlantic-city> [https://perma.cc/C95N-KVJ4].

190. *FEMA Flood Map Service Center for Atlantic City, New Jersey*, FEMA, <https://msc.fema.gov/portal/search> (search in search bar for "Atlantic City, New Jersey") (last visited Mar. 3, 2019).

maps in neighboring Mobile County, Alabama.¹⁹¹ The problem is not just inaccurate depth; new maps might also show thousands of properties at risk of flooding for the first time.¹⁹²

FEMA's outdated approach to the science of flood risk and inability to keep its maps current have resulted in a significant underestimation of the risk of flooding in many areas. Anecdotally, it has become commonplace to hear of virtually back-to-back occurrences of floods with 500- or 1,000-year return intervals.¹⁹³ One study examined properties that had flooded repeatedly in Houston during the 30-year period from 1978 to 2008 and found that almost half of them—47%—were located outside the 100-year flood zone.¹⁹⁴ Large scale national evaluations have lent further support to the idea that FEMA's maps understate the risk. One recent study used newer, higher-resolution data to evaluate from scratch the risk of flooding caused by rainfall in the contiguous United States. The authors found that FEMA's maps significantly underestimate the risk: FEMA's maps show thirteen million Americans living in 100-year flood zones, while the authors' analysis suggests the number should be 40.8 million.¹⁹⁵ There were similarly large discrepancies in the total property value at risk, and the authors projected—using estimates of population growth but *not* the effects of climate change—that the problem is getting worse.¹⁹⁶

C. Communicating Flood Risk

For individuals to have meaningful knowledge of the flood risk they face, the scientific and regulatory understanding of that risk (such as it is) must be

191. Keller et al., *supra* note 187.

192. *Id.* In many cases, being re-mapped into a flood zone means being subject to the NFIP's purchase mandate for the first time, creating a financial burden that generates intense local opposition to new flood maps. See Pralle, *supra* note 121, at 15.

193. In Houston, for example, the "Tax Day" and "Memorial Day" floods of 2016 and Hurricane Harvey in 2017 all featured rainfall currently estimated to have only a 0.2% chance of occurring in any given year (a so-called "500-year" event). *Spring Floods 2016*, HARRIS COUNTY FLOOD CONTROL DISTRICT (Feb. 21, 2018), <https://www.hcfd.org/flooding-floodplains/storm-center/spring-floods-2016> [<https://perma.cc/S2Y7-R7ZK>]; Memorandum from Jeff Linder, Dir. Hydrologic Operations/Meteorologist, to Harris Cty. Flood Control Dist. Flood Watch/Partners 3 (June 4, 2018), <https://www.hcfd.org/media/2678/immediate-flood-report-final-hurricane-harvey-2017.pdf> [<https://perma.cc/D9GH-98DX>].

194. Wesley E. Highfield, Sarah A. Norman & Samuel D. Brody, *Examining the 100-Year Floodplain as a Metric of Risk, Loss, and Household Adjustment*, 33 RISK ANALYSIS 186, 189 (2012).

195. Oliver E.J. Wing et al., *Estimates of Present and Future Flood Risk in the Conterminous United States*, 13 ENVTL. RES. LETTERS 1, 3 (2018).

196. *Id.* at 5.

available to them in some way. The primary mechanism by which flood risk is communicated is through FEMA's maps, and the job they do is poor.

Much of the information in FEMA's maps (known as "Flood Insurance Rate Maps" or "FIRMs") is built on the statistical construct known as a 100-year flood.¹⁹⁷ Within the 100-year flood zone (known as the "Special Flood Hazard Area"), FIRMs show the expected depth of the water above surrounding grade (the "base flood elevation").¹⁹⁸ FIRMs also show which areas are expected to flood during 500-year events, but not the depth of water during such episodes.¹⁹⁹ They do not show the effects of more severe (and therefore less likely) events. In coastal areas, FIRMs also depict areas that are expected to be subject to wave action during floods, which is potentially far more destructive.²⁰⁰ The Special Flood Hazard Area is the most important designation in a FIRM: within it, the NFIP's purchase mandate applies, as do local building codes that require new and substantially damaged homes to be built above base flood elevation.²⁰¹

The concept of the 100-year flood has long been the subject of intense criticism.²⁰² Even setting aside issues surrounding the accuracy of FEMA's determinations of what constitutes a 100-year flood, there are problems with relying on such a construct in the first place. For those within the 100-year flood zone, the term creates the misimpression that floods should happen only once every 100 years, and that the occurrence of one means that the next is 99 years away.²⁰³ FEMA has for many years battled valiantly to combat this

197. FED. EMERGENCY MGMT. AGENCY, TECHNICAL FACT SHEET NO. 3, USING A FLOOD INSURANCE RATE MAP (FIRM): HOME BUILDER'S GUIDE TO COASTAL CONSTRUCTION 1 http://www.flash.org/resources/files/HGCC_Fact03.pdf [<https://perma.cc/65F8-759L>].

198. *FEMA Flood Map Service Center: FAQs*, FED. EMERGENCY MGMT. AGENCY, <https://msc.fema.gov/portal/resources/faq> [<https://perma.cc/UW6Z-9FTS>] (last visited Jan. 25, 2019).

199. See FED. EMERGENCY MGMT. AGENCY, HOW TO READ A FLOOD INSURANCE RATE MAP TUTORIAL (2003) https://www.fema.gov/media-library-data/20130726-1550-20490-1950/ot_firm.pdf [<https://perma.cc/2WYX-NMBV>].

200. *Id.*

201. *Id.*

202. See, e.g., Highfield, Norman & Brody, *supra* note 194, at 186 ("[T]he 100-year floodplain is neither accurate nor sufficient in guiding communities and household decisions to mitigate the adverse economic impacts of floods."); Koerth-Baker, *supra* note 164 (calling the 100-year flood "one of the most misunderstood terms in disaster preparedness").

203. See, e.g., Scales, *supra* note 13, at 9 ("What the average person actually understands . . . is that once there has already been such a flood in his area, he is safe for the next ninety-nine years."); see also Nadja Popovich & Claire O'Neill, *A '500-Year Flood' Could Happen Again Sooner Than You Think. Here's Why*, N.Y. TIMES (Aug. 28, 2017), <https://nyti.ms/2vEVM4y> [<https://perma.cc/459R-P3NC>] (noting tweet from Donald Trump referring to Harvey as "a once in 500 year flood").

misimpression (preferring now to speak of the 26% chance of a flood occurring over the course of a 30-year mortgage, for example), but it persists. One of the many cognitive biases affecting perception of flood risk is the belief that long-term averages will be replicated in short samples of data. So, for example, people significantly underestimate the odds of getting heads four times in a row when flipping a coin or, having been told that a flood was caused by a 100-year storm, the odds that it will happen again the following year.²⁰⁴

For those outside the 100-year floodplain, the problems with the construct are more severe. Being outside the Special Flood Hazard Area and therefore not obligated to purchase flood insurance is understood by many as meaning that flood risk is not a significant problem.²⁰⁵ More than half the homes damaged by Hurricane Harvey—more than 100,000 in number—were outside of all floodplain designations.²⁰⁶ To many who lived outside FEMA-designated floodplains and yet were flooded by Harvey, the fact that their homes were capable of being flooded came as a shock.²⁰⁷ In the Houston suburb The Woodlands, the bright lines demarcating NFIP flood zones incentivized gamesmanship, with developers trucking in tens of thousands of cubic yards of dirt to build homes that were literally inches above base flood elevation and thus not required to buy flood insurance, most of which flooded during Harvey.²⁰⁸ Notably, although Harvey was an unprecedented storm in many respects,²⁰⁹ it was not unique in the recent history of the Houston area.

204. Robert J. Meyer, *Why We Under-Prepare for Hazards*, in ON RISK AND DISASTER: LESSONS FROM HURRICANE KATRINA, 153, 160 (Ronald J. Daniels, Donald F. Kettl & Howard Kunreuther eds., 2006).

205. See CTR. FOR DISASTER RESILIENCE, UNIV. OF MD. & CTR. FOR TEX. BEACHES & SHORES, TEX. A&M UNIV., THE GROWING THREAT OF URBAN FLOODING: A NATIONAL CHALLENGE 35 (2018) [hereinafter URBAN FLOODING], <https://cdr.umd.edu/sites/cdr.umd.edu/files/urban-flooding-report-online-revised.pdf> [https://perma.cc/A4LV-YG4L] (noting that FIRMs “have . . . been incorrectly seen as tools to communicate basic flood risk—property is subject to flooding (in the SFHA) or not (outside the SFHA)”).

206. David Hunn et al., *Harvey’s Floods: Most Homes Damaged by Harvey Were Outside Flood Plain, Data Show*, HOUS. CHRON. (Mar. 30, 2018), <https://www.houstonchronicle.com/news/article/In-Harvey-s-deluge-most-damaged-homes-were-12794820.php> [https://perma.cc/K9DD-2DNV].

207. *Id.*

208. John Schwartz, James Glanz & Andrew W. Lehren, *Builders Said Their Homes Were Out of a Flood Zone. Then Harvey Came*, N.Y. TIMES (Dec. 2, 2017), <https://nyti.ms/2BCdrON> [https://perma.cc/DN4S-JNVF].

209. The National Weather Service called Harvey “the most significant tropical cyclone rainfall event in . . . United States history since reliable rainfall records began in the 1880s.” Donovan Landreneau, *Hurricane Harvey*, NAT’L WEATHER SERV., <https://www.weather.gov/lch/2017harvey> [https://perma.cc/6K4Y-LHDJ] (last visited Jan. 25, 2019).

Harvey set flood records in only thirteen of Harris County's twenty-two watersheds, several of which experienced higher water levels during Tropical Storm Allison in 2001.²¹⁰ The Tax Day floods in 2016 saw a similar pattern: more than half the structures damaged were outside the 100-year floodplain.²¹¹

Using the 100-year flood zone as the fulcrum of the NFIP implies a bright line between those at risk and those who need not worry about flooding, and this bright line is reflected in NFIP participation rates. Participation rates in the NFIP have always been disappointing, in part because the program's purchase mandate is woefully underenforced.²¹² Relatively few of those living outside FEMA's 100-year floodplain choose to purchase flood insurance.²¹³ Nationally, the NFIP's market penetration outside Special Flood Hazard Areas has been estimated at 1%.²¹⁴ It is hard to know how many of those households should purchase flood insurance, given the wide range of flood risk that can be found in areas outside FEMA-designated Special Flood Hazard Areas. Comparing the number of NFIP policies in effect with independent estimates of the number of households at risk of flooding gives some sense of the problem. According to one study, which found that FEMA's 100-year flood zones were far too small, there are 15.4 million homes located in 100-year flood zones across the country,²¹⁵ while there are only about 4.8 million flood insurance policies for residential properties currently in force.²¹⁶

More anecdotally, virtually every significant flood is followed by the revelation that only a relatively small percentage of those flooded were insured. In Harris County, which has 1.7 million housing units, there were just 249,000 flood insurance policies in place before Harvey; it has been

210. See Zach Despart, *Funding Gap Post-Harvey Shows Need for Better Flood Maps*, HOUS. CHRON. (June 7, 2018), <https://www.pressreader.com/usa/houston-chronicle/20180607/281573766389961>; Memorandum from Jeff Linder, *supra* note 193, at 4–7.

211. Hunn et al., *supra* note 206.

212. Enforcement of the purchase mandate is not FEMA's responsibility; rather, it is left up to the regulator with oversight of the lender in question. Compliance with the lender mandate has been estimated at between 75 and 80% nationally, with significant local variation. LLOYD DIXON ET AL., RAND CORP., *THE NATIONAL FLOOD INSURANCE PROGRAM'S MARKET PENETRATION RATE: ESTIMATES AND POLICY IMPLICATIONS*, at xvii, 2 n.5 (2006), https://www.fema.gov/media-library-data/20130726-1602-20490-2804/nfip_eval_market_penetration_rate.pdf [<https://perma.cc/MBJ3-D2FB>].

213. *Id.* at xviii.

214. *Id.* at xvi.

215. Wing et al., *supra* note 195, at 5.

216. *Policies in Force by Occupancy Type*, FED. EMERGENCY MGMT. AGENCY, <https://www.fema.gov/policies-force-occupancy-type> [<https://perma.cc/X6ZZ-A9S9>] (last visited Mar. 4, 2019).

estimated that about 70% of the residential flood damage caused by Harvey was not covered by insurance.²¹⁷ Similar figures emerged in various parts of the Gulf Coast that were devastated by Hurricane Katrina.²¹⁸ Only 20% of those flooded by Hurricane Sandy had flood insurance.²¹⁹ Of the 57,923 households that suffered the worst categories of damage in flooding caused by extreme rainfall in Louisiana in 2016, only 37% had flood insurance.²²⁰ At least part of the blame for this state of affairs lies in the fact that many simply do not know that they are at risk of being flooded.

Various empirical studies have attempted to measure more directly what people understand about their risk of flooding. They have commonly found that people, when asked, did not know that they lived in flood-prone areas.²²¹ One study found that most people (64%) were unable to locate their own homes on maps showing hurricane risk areas.²²² In another, researchers interviewed people living in the paths of Hurricanes Sandy and Isaac in the days and hours before those storms made landfall.²²³ The study's authors

217. Leslie Scism & Nicole Friedman, *Houston Residents Return Home to Scary Reality: No Insurance Coverage*, WALL ST. J. (Sept. 1, 2017, 8:32 PM), <https://www.wsj.com/articles/houston-residents-return-home-to-scary-reality-no-insurance-coverage-1504300222> [<https://perma.cc/M4QY-PF7W>]; see also Nicole Friedman & Leslie Scism, *As Hurricane Season Arrives, U.S. Homeowners Haven't Fixed Their Big Underinsurance Problem*, WALL ST. J. (July 18, 2018, 6:45 PM), <https://www.wsj.com/articles/american-homeowners-still-have-a-big-underinsurance-problem-1531922482> [<https://perma.cc/XQ75-AHUK>].

218. Along the Gulf Coast of Mississippi, which was virtually wiped out by storm surges, less than 10% of homes had flood insurance. Scales, *supra* note 13, at 15. In St. Bernard Parish, 57.7% of homes had flood insurance. Robert H. Jerry, II & Steven E. Roberts, *Regulating the Business of Insurance: Federalism in an Age of Difficult Risk*, 41 WAKE FOREST L. REV. 835, 877 (2006). In Orleans Parish, only 40% of homes had flood insurance. *Id.*

219. David W. Chen, *In New York, Drawing Flood Maps Is a 'Game of Inches'*, N.Y. TIMES (Jan. 7, 2018), <https://nyti.ms/2EkURv7> [<https://perma.cc/6CRM-NUQT>].

220. Bryn Stole, *How Much Damage Did the August 2016 Flood Do? Data Becomes Clearer, but Gaps Remain*, ADVOCATE (Aug. 7, 2017, 6:56 PM), https://www.theadvocate.com/louisiana_flood_2016/article_66d26396-7974-11e7-ba41-83143d6dfef1.html [<https://perma.cc/RDR7-WHB2>].

221. URBAN FLOODING, *supra* note 205, at 34 (“A majority of residents in urban flood-prone areas generally do not understand the actual risks . . . that they face from urban flooding. . . . Numerous federal reports over the last decade have indicated that miscommunication is a significant challenge in all types of flooding.”).

222. Sudha Arlikatti et al., *Risk Area Accuracy and Hurricane Evacuation Expectations of Coastal Residents*, 38 ENV'T & BEHAV. 226, 239 (2006).

223. See Robert J. Meyer et al., *The Dynamics of Hurricane Risk Perception: Real-Time Evidence from the 2012 Atlantic Hurricane Season*, 95 BULL. AM. METEOROLOGICAL SOC'Y 1389, 1390 (2014). There is a rich body of literature examining communication of risk surrounding shorter term events, like hurricanes. That literature has tended to highlight the shortcomings of the way we communicate about the risks of coming storms, and particularly the

noted that respondents displayed a prominent bias in favor of wind risk and against flood risk, consistently underestimating the threat posed by storm surge and flooding.²²⁴

What of those who have already been flooded? Surely the experience of seeing one's house underwater creates the requisite knowledge that one is facing some quantum of flood risk.²²⁵ Indeed, so-called "repetitive loss properties," a category FEMA defines as those that have had two or more claims of \$10,000 or more in ten years, have become a poster child for irresponsibility.²²⁶ Egregious examples make frequent appearances in the popular press.²²⁷ By eliminating certain rates and imposing new adaptation requirements on homes that are more than 50% damaged in a flood, the NFIP does treat the experience of being flooded as a significant turning point. And

apparent failure of risk communications to motivate people to take relatively simple precautions like evacuating in the face of a storm or installing storm shutters over their windows.

224. *Id.* at 1394. Notably, the study also found that while 42% of respondents indicated that they had flood insurance, only 51% said they had a separate flood insurance policy, indicating that fully half of respondents who thought they had flood insurance were not in fact covered. *Id.* at 1400. Similar problems have been observed in other areas. LLOYD DIXON ET AL., RAND CORP., THE COST AND AFFORDABILITY OF FLOOD INSURANCE IN NEW YORK CITY 18 (2017), https://www.rand.org/pubs/research_reports/RR1776.html [<https://perma.cc/6TYK-GKMX>] (finding in a survey of New Yorkers post-Sandy, that 16% of homeowners believed they had flood insurance but did not).

225. See Caroline Kelly, *Hensarling to Flood Victims: 'At Some Point, God's Telling You to Move,'* DALL. MORNING NEWS (Sept. 21, 2017), <https://www.dallasnews.com/news/harvey/2017/09/21/hensarling-flood-victims-point-gods-telling-move> [<https://perma.cc/HHV6-FDWP>] (reporting remarks of Congressman Jeb Hensarling).

226. In 2004, John Stossel, a television host formerly of Fox News, wrote a notorious essay about buying flood insurance on his new beachfront vacation home entitled *Confessions of a Welfare Queen*. John Stossel, *Confessions of a Welfare Queen: How Rich Bastards Like Me Rip Off Taxpayers for Millions of Dollars*, REASON (Mar. 1, 2004), <http://reason.com/archives/2004/03/01/confessions-of-a-welfare-queen> [<https://perma.cc/8AD9-TLA9>]. The examples I have in mind are more prosaic. See *infra* note 227.

227. Virtually every story about the woes of the National Flood Insurance Program features jarring examples prominently. See, e.g., Michael Grunwald, *How Washington Made Harvey Worse*, POLITICO (Aug. 29, 2017), <https://www.politico.com/magazine/story/2017/08/29/a-storm-made-in-washington-215549> [<https://perma.cc/UN24-JCL3>] (citing home valued at less than \$115,000 that has flooded sixteen times in eighteen years, resulting in \$800,000 in claims); Noel King, *National Flood Insurance Program Will Pay Out Billions for a Few Properties*, NPR (Nov. 21, 2017, 4:45 PM), <https://www.npr.org/2017/09/21/552708255/national-flood-insurance-program-will-pay-out-billions-for-a-few-properties> [<https://perma.cc/22X7-MXWP>] (reporting a home that cost \$83,000 in 1992 and has received \$700,000 in claims payments since 2009); Eric Lipton, Felicity Barringer & Mary Williams Walsh, *Flood Insurance, Already Fragile, Faces New Stress*, N.Y. TIMES (Nov. 12, 2012), <https://nyti.ms/2vwAVR5> [<https://perma.cc/K6Y9-BMJT>] (citing homes in Biloxi, Mississippi, and Humble, Texas, that—despite being worth \$183,000 and \$116,000, respectively—have received \$1.47 million and \$2 million in claims payments from the NFIP).

it is certainly true that more could be done to address the problem. Indeed, many of those who have been flooded repeatedly express interest in being bought out and relocating.²²⁸

But even when a flood has happened, the knowledge it creates about flood risk going forward is often amorphous.²²⁹ One study attempted to measure “whether a severe flood causes homeowners to update their assessment of flood risk” by looking at changes in property values in St. Louis County following the severe flooding there in 1993.²³⁰ The study concluded that property values in 100-year floodplains were not affected to a statistically significant degree by the flooding, suggesting that the market had already been aware of the flood risk and priced it in.²³¹ Prices did fall in 500-year floodplains, and in communities along the Missouri and Mississippi rivers generally, implying that the real estate market was capitalizing new information about flood risk.²³²

The task of communicating flood risk to non-experts with enough precision and urgency to induce them to take relatively simple steps like buying flood insurance has proved so challenging that many experts have concluded that simple messages are most effective. Reflecting on Hurricane Irma’s impact in Florida, Roy Wright—until recently the Director of the NFIP—said that people should pay *less* attention to flood maps: “We really gotta help people move beyond and quit focusing on the lines,” he told the *Miami Herald*.²³³ Instead, he suggested, everyone living in Florida should consider themselves at risk, and buy flood insurance.²³⁴ Others have echoed the sentiment.²³⁵

228. See Michael Kimmelman, *Lessons from Hurricane Harvey: Houston’s Struggle Is America’s Tale*, N.Y. TIMES (Nov. 11, 2017), <https://nyti.ms/2jh20r1> [<https://perma.cc/CH97-RJ6H>] (profiling several homeowners “hoping for a buyout”).

229. Statistically, the occurrence of an event with a 0.1% chance of occurring should tell us nothing about the chance of a similar event occurring in the following year. Realistically, on the other hand, such an event may lead to a significant recalculation of the odds of similar storms, in a field in which estimates are based on roughly a century of data at best.

230. Carolyn Kousky, *Learning from Extreme Events: Risk Perceptions after the Flood*, 86 LAND ECON. 395, 395 (2010).

231. *Id.* at 415–17.

232. *Id.* at 417–18.

233. Jenny Staletovich, *America’s Flood Insurance Chief Has a Message for All Floridians: You’re at Risk*, MIAMI HERALD (Mar. 5, 2018, 6:51 PM), <https://www.miamiherald.com/news/weather/hurricane/article203631769.html> [<https://perma.cc/6D4G-BXZZ>].

234. *Id.*

235. Brian K. Sullivan, *‘100-Year Floods’ Happen More Often Than People Think*, INS. J. (Apr. 22, 2016), <https://www.insurancejournal.com/news/national/2016/04/22/406148.htm> [<https://perma.cc/6HSJ-7SQQ>] (“If you live in Houston, buy flood insurance.”).

Ideally, flood insurance premiums themselves would be an effective way to communicate the risk of flooding. This is, after all, one of the ways in which risk-rated premiums are said to help combat moral hazard, by translating the often difficult to quantify risks people take into dollars and cents. Subsidized flood insurance premiums have thus created a sort of vicious cycle: They mask the true risk people face, lulling them into a false sense of security while also undermining the argument that they knew what they were getting into and thus do not deserve financial support. This is a hard cycle to break, because any change in the structure of subsidized rates can have enormous impacts on the people who have benefited from them in the past.

The experience of New York City during and after Hurricane Sandy illustrates many of these problems. Before Sandy, New York's FIRMs dated from the 1980s.²³⁶ Flooding from the storm far exceeded even the 500-year flood zones the maps depicted. The city's mayor at the time, Michael Bloomberg, was frank in acknowledging that there was nothing that could be done to eliminate the risk entirely, but insisted that homes would be rebuilt to make them more resistant to flooding, and called on FEMA to update its maps.²³⁷ The following year, FEMA released preliminary revised FIRMs, with 100-year floodplains that closely tracked areas that had flooded during Sandy. The maps would have doubled the number of people living in flood zones.

Six months after the preliminary maps were released, the city filed a 180-page appeal, arguing that FEMA had overestimated both the base flood elevation and the size of the 100-year flood zone.²³⁸ FEMA's proposed maps, the city argued, overstated the size of the flood zone by 35%—an area that is

236. Technically, FEMA had made revisions to these maps, most recently in 2007, but these revisions were not based on new technical studies. As FEMA explained, New York City's FIRMs might have been dated 2007, but they were "based on storm surge models and statistical analyses from the 1980s." FED. EMERGENCY MGMT. AGENCY, DESIGNING FOR FLOOD LEVELS ABOVE THE BFE AFTER HURRICANE SANDY 3 (2013), https://www.fema.gov/media-library-data/1381405016896-8bdeadf634c366439c35568a588feb24/SandyRA5DesignAboveBFE_508_FINAL2.pdf [<https://perma.cc/UA3G-Z5QX>]. FEMA vaguely warned that base flood elevations and flood hazard zones based on such old studies "may understate actual flood risk" and suggested that people consulting the FIRM verify "[t]he date of the technical studies . . . by reviewing the associated FIS [Flood Insurance Study]." *Id.*

237. David W. Chen & Michael M. Grynbaum, *Mayor Pledges to Rebuild and Fortify Coast*, N.Y. TIMES (Dec. 6, 2012), <https://nyti.ms/2GtVt3D> [<https://perma.cc/5Z4F-SZX2>].

238. Letter from Daniel A. Zarrilli, Dir., City of N.Y. Mayor's Office of Recovery & Resiliency, to Michael Moriarty, Dir., Mitigation Div. Fed. Emergency Mgmt. Agency Region 2 (June 26, 2015), https://www1.nyc.gov/assets/floodmaps/images/content/pages/1-NYC%20FEMA%20Appeal%20FINAL%20with%20Appendices%20and%20Cover%20Letter%2006252015_web.pdf [<https://perma.cc/4CRK-LNSB>].

home to 170,000 people.²³⁹ In addition to its technical objections, the city commissioned the RAND Corporation to study the financial burden the proposed maps would have on its residents. The RAND Corporation's report, foreshadowing the nationwide conclusions in FEMA's own affordability analysis,²⁴⁰ found that flood insurance was already too expensive for many New Yorkers, and that the new preliminary maps would make the problem worse.²⁴¹ The City of New York and FEMA recently announced that the end result of this dispute will be two maps: one that depicts the city's *current* flood risk for purposes of the NFIP's rates and purchase mandate, and another that depicts *future* flood risk, for purposes of the City's planning and mitigation efforts.²⁴² Under these circumstances, residents can arguably be forgiven for not knowing when or how badly their homes might flood.²⁴³

Of course, this argument should not be taken too far. It is not true that nobody has any meaningful sense of the flood risk they face. In many places the risk, especially over longer time horizons, is glaringly obvious. Indeed, despite its traditional insistence on subjective knowledge, the tort doctrine of assumption of risk has long incorporated an obviousness exception, under which some risks are so obvious that a plaintiff can be said to have known of

239. *Id.*

240. See generally FED. EMERGENCY MGMT. AGENCY, *supra* note 236.

241. DIXON ET AL., *supra* note 224, at xxv.

242. Press Release, Fed. Emergency Mgmt. Agency, Mayor De Blasio and FEMA Announce Plan to Revise NYC's Flood Maps (Oct. 17, 2016), <https://www.fema.gov/news-release/2016/10/17/mayor-de-blasio-and-fema-announce-plan-revise-nycs-flood-maps> [https://perma.cc/RQ77-7CQB].

243. Chen, *supra* note 219 ("The various maps that the residents have used to determine the flood boundaries—whether from FEMA, the Department of City Planning or other sources—offer conflicting results about whether a house is in the flood plain, Ms. Roff said. On her own block of bungalows, she said, one homeowner pays \$5,000 a year in premiums. A few doors down, another does not have insurance. Just beyond that, a new homeowner is spending \$300,000 to raise a house 20 feet like 'a castle in the sky,' she said, thereby avoiding paying any insurance.").

Another theme that is highlighted by New York's dispute with FEMA is the way local governments have in some instances worked to keep their constituents in a state of ignorance about their flood risk in the interest of avoiding the pain of higher insurance premiums and other effects on the local tax base. Indeed, New York is an outlier in working to develop a forward-looking map to help its residents understand their flood risk. Perhaps the most notorious example is the North Carolina state legislature's decision, responding to pressure from officials in the Outer Banks, to overrule a state scientific panel and set unrealistically low assumptions of future sea-level rise for purposes of evaluating private development and public infrastructure investments. See Isaac Stanley-Becker, *Scientists Warned of Rising Sea Levels in North Carolina. Republican Lawmakers Shelved Their Recommendations*, WASH. POST (Sept. 14, 2018), <https://www.washingtonpost.com/news/morning-mix/wp/2018/09/14/scientists-warned-of-rising-sea-levels-in-north-carolina-republican-lawmakers-shelved-their-recommendations/> [https://perma.cc/8KVS-6HFS].

them as a matter of law.²⁴⁴ The danger of slipping on ice is a classic example,²⁴⁵ as is the danger of diving headfirst into a shallow pool.²⁴⁶ The question is whether a risk is so obvious that “it is clear that any person of normal intelligence must have understood the danger.”²⁴⁷

This idea is certainly applicable in the flood context. Sea level rise is already changing life in many places in the United States, particularly along the East Coast.²⁴⁸ Nobody buying waterfront property in 2019 in Miami, the Outer Banks of North Carolina, barrier islands along the Jersey Shore, or any number of other high-risk locations could credibly express shock if a damaging storm comes along. My aim is not to suggest that all Americans are laboring in ignorance of flood risk, but rather to suggest that we should not assume, as many too often do, that flood risk is obvious to everyone affected by it.

IV. CHOICE

Simply understanding one’s risk of flood—hard as that is—is not enough. In order to have assumed the risk of flooding one must, armed with the requisite knowledge, *choose* to encounter the risk. Under the pure laissez-faire conception of assumption of risk that applied in torts cases from the early twentieth century, formal choice was all that mattered. Thus Lamson, not being enslaved and thus technically free to leave his job for fear of falling axes, was said to have assumed any risk of injury by choosing to stay. That formalist vision of the nature of choice in a modern economy has long been abandoned; we now understand that people make choices about things like employment in an economic and social context that constrains their behavior, such that merely remaining in a job no longer feels morally significant. This Part argues that the choice of where to live is similarly constrained. There are

244. WILLIAM L. PROSSER, TORTS 310 (2d ed. 1955) (“[T]here are certain risks which anyone of adult age must be taken to appreciate . . . [W]here it is clear that any person of normal intelligence . . . must have understood the danger, the issue must be decided by the court.”); W. PAGE KEETON ET AL., PROSSER AND KEETON ON THE LAW OF TORTS § 68, at 488 (5th ed. 1984) (“There are some things . . . which are so far a matter of common knowledge in the community, that in the absence of some satisfactory explanation a denial of such knowledge simply is not to be believed.”).

245. PROSSER, *supra* note 244, at 310.

246. See *Griebler v. Doughboy Recreational Inc.*, 466 N.W.2d 897, 901 (Wis. 1991); *see also* *O’Sullivan v. Shaw*, 726 N.E.2d 951, 956 (Mass. 2000) (collecting cites).

247. PROSSER, *supra* note 244, at 301; *Poole v. Coakley & Williams Constr. Co., Inc.*, 31 A.3d 212, 223 (Md. 2011) (distinguishing danger of slipping on visible snow and ice from danger of slipping on invisible “black” ice).

248. See *supra* text accompanying notes 67, 179, 189.

a host of obstacles—legal, economic, emotional, and cognitive—that act as constraints on the choices we make when moving to or remaining in a flood-prone house. These obstacles mean that for some (but not all), the choice to encounter the risk of flood is not much of a choice at all.

A. *The Choice to Remain*

Americans are not as mobile as perhaps they should be, and rates of interstate mobility have been declining for decades.²⁴⁹ As different regions and metropolitan areas of the country face widely divergent economic futures, this lack of mobility has become a problem that has attracted enormous attention. To economists, in particular, mobility is the free market solution to the problem of declining economic sectors and regions; if median wages in West Virginia are a fraction of what they are in New York, then clearly there would be gains in welfare (and GDP) if people simply left West Virginia in search of the economic opportunities offered by more prosperous locales.

For decades, various efforts aimed at addressing poverty and inequality have thus focused on helping move people from one place to another, either within a particular city, as in the case of Chicago's Gautreaux program, or nationally, as in the case of the federal Moving to Opportunity program.²⁵⁰ Social scientists studying the outcomes of these programs have tended to conclude that moving to a more prosperous and integrated area can indeed have significant positive impacts on a family's life outcomes.²⁵¹ Convincing people to move (and to stay) has, however, proven to be more difficult.

Perhaps the most significant factors that dissuade people from moving are the ones that are hardest to quantify. The places we live are where we make friends and raise families, and moving often means destroying or compromising these social networks.²⁵² For many of us, the neighborhoods, towns, or cities we call home are deeply ingrained in our self-identities. Many people simply love their homes, and express an inability to imagine life elsewhere.²⁵³ In many flood prone parts of the country, residential housing

249. David Schleicher, *Stuck! The Law and Economics of Residential Stagnation*, 127 YALE L.J. 78, 81–82 (2017).

250. *Id.* at 104–05.

251. *Id.* at 107.

252. *Id.* at 123.

253. One empirical study that examined willingness to relocate among those affected by Hurricane Sandy found little relationship between households' proximity to the ocean (a rough proxy for flood risk) and their interest in relocating. The authors speculate that "non-geophysical factors, such as household-level confidence in the ability to adapt and continue habitation in such

patterns are still shaped by a history of racial discrimination, which often forced minority communities into low-lying areas.²⁵⁴

There are many more quantifiable obstacles to leaving home. For homeowners, the overwhelming majority of NFIP policyholders, moving typically involves selling a home and buying a new one, which entails significant transaction costs. Homeowners whose home equity has been reduced or even eliminated by economic downturns—or by a flood—might face particular obstacles to leaving.²⁵⁵ There are less obvious financial costs to moving too. Thirteen percent of Americans work for state and local governments, and 92% of those workers have defined benefit public pensions.²⁵⁶ Many of these plans have long vesting periods and other features that restrict their beneficiaries' ability to move.²⁵⁷ The possibility of losing access to various public benefits is another disincentive to moving.

In order to leave a flood-prone home one must have somewhere else to go. Along with obstacles to leaving a particular place are obstacles to entering another. Land use restrictions have attracted a great deal of negative attention recently, as housing prices in certain desirable areas of the country have skyrocketed.²⁵⁸ To many, restrictions on development have made large contributions to this problem, thereby making it harder for economically prosperous regions to attract new workers from underperforming areas.²⁵⁹ Many of the regions that are attracting new workers are of course also flood-prone; my point is not that zoning laws keep people from moving to dry areas, but rather that they are one of many factors that combine to make the prospect of moving out of a flood zone too costly to contemplate. Occupational licensing is another barrier to entry worth mentioning. The number of jobs that require state licenses has increased dramatically in recent decades,²⁶⁰

locations, values, and other qualitative personal factors play a larger role.” Anamaria Bukvic et al., *The Role of Proximity to Waterfront in Residents' Relocation Decision-Making Post-Hurricane Sandy*, 154 OCEAN & COASTAL MGMT. 8, 8 (2018).

254. See, e.g., Craig E. Colten, *Basin Street Blues: Drainage and Environmental Equity in New Orleans 1890–1930*, 28 J. HIST. GEOGRAPHY 237 (2002).

255. Schleicher, *supra* note 249, at 128–29.

256. *Id.* at 124.

257. *Id.* (“[E]ighteen states require a teacher to stay in the system for eight or more years before she can access her benefits.”).

258. *Id.* at 114–15.

259. One study found that land use restrictions lowered aggregate U.S. growth by 36% from 1964 to 2009. Chang-Tai Hsieh & Enrico Moretti, *Housing Constraints and Spatial Misallocation* 1 (Nat'l Bureau of Econ. Research, Working Paper No. 21,154, 2015, rev. 2018). Schleicher notes that economists have come up with a broad range of estimates of the negative effect of zoning laws on GDP. Schleicher, *supra* note 249, at 103 n.101.

260. Schleicher, *supra* note 249, at 117 & n.166. To illustrate the surprising breadth of these laws, Schleicher offers some examples: “animal breeder[s], auctioneer[s], bartender[s], florist[s],

such that roughly 25% of the workforce is now covered by state licensing laws—a larger percentage than minimum wage earners or private sector union members.²⁶¹ The burden of acquiring the licenses needed varies tremendously, but the broader point is that licensing regimes “create substantial barriers to entry for many classes of workers.”²⁶²

B. Notice and the Choice to Arrive

The decision to move to a flood-prone home is more likely to be a choice made under conditions of freedom than the decision to remain in a home one already owns. The interaction between knowledge and choice has an important temporal quality: if one learns the flood risk associated with a property and *then* decides to move in, the case for having assumed the risk is much stronger.

Unfortunately, there is no federal law requiring that buyers be notified in advance of a home’s flood risk. Many states have such laws, although many do not. A recent report by the NRDC compiled the laws on flood disclosure in all fifty states.²⁶³ Twenty-one states have no statutory or regulatory requirement that buyers be notified of a home’s flood history.²⁶⁴ Florida, one of the country’s epicenters of flood risk, is one such state.²⁶⁵ In many states that do have disclosure requirements, the laws are vaguely worded or carry weak penalties. New York, for instance, does require that sellers disclose whether a property is located in a floodplain, but the statutory penalty for failing to make this disclosure is a \$500 credit towards the purchase price at closing, a punishment so low that, the NRDC reported, many sellers simply opt not to say anything.²⁶⁶ Louisiana and Mississippi, on the other hand, both

interior designer[s], . . . hair braider[s], and scrap metal recycler[s]” all now require licenses in some states. *Id.* at 118.

261. *Id.* at 118.

262. *Id.* at 120. The effect of these barriers has been observed empirically. For example, “barbers and hairdressers are 27% less likely to move between states but only 7% less likely to move within state than their peers in other [non-licensed] occupations.” *Id.* (alteration in original).

263. See Joel Scata, *Home Buyers Face Stacked Deck to Learn of Past Floods*, NAT. RESOURCES DEF. COUNCIL: EXPERT BLOG (Aug. 16, 2018), <https://www.nrdc.org/experts/joel-scata/home-buyers-face-stacked-decks-learn-past-floods> [<https://perma.cc/7CJ3-CX3Y>]; see also *How States Stack Up on Flood Disclosure*, NAT. RESOURCES DEF. COUNCIL, <https://www.nrdc.org/flood-disclosure-map> [<https://perma.cc/QT4R-7CFK>] (last visited Mar. 4, 2019).

264. Scata, *supra* note 263.

265. *Id.*

266. *Id.*

have mandatory, broadly worded disclosure laws.²⁶⁷ To make matters worse, federal law prohibits FEMA from releasing claims history on individual properties, preventing buyers from finding this information themselves.²⁶⁸

Of course, there will always be a variety of factors that affect a choice. The mere presence of a range of costs supporting the decision to remain in a home despite the risk of flood does not necessarily mean that the decision was not made freely. The question must be whether the circumstances compel a particular choice so strongly that they amount to a form of coercion, such that the choice isn't freely made at all.²⁶⁹ To put the point another way, is the alternative course of action real (in the sense of truly available), or illusory? This question cannot have one answer for all Americans who live with a risk of flooding. After all, some people *do* choose to leave their flood-prone homes.²⁷⁰ My goal here is to show merely that *some* subset of people truly have not chosen to expose themselves to the flood risk they face.

We are comfortable with the idea that some workers' "choice" to perform dangerous jobs is no choice at all, while for others the choice is meaningful. There is a world of difference between the factory worker who knows the risk of mangled limbs and remains at the loom and the highly compensated lawyer who knows the risk of stress, inadequate sleep, and a career spent sitting down and remains at the word processor. So too is there a world of difference between the third-generation resident of New Orleans' Lower Ninth Ward

267. NAT. RESOURCES DEF. COUNCIL, *supra* note 263.

268. See *Ehlmann v. Dep't of Homeland Sec.*, No. 4:12-CV-1392-RWS, 2013 WL 3724906, at *4–5 (E.D. Mo. July 15, 2013) (denying FOIA request to compel FEMA to release names and addresses for NFIP policies on repetitive loss properties); see also *Forest Guardians v. FEMA*, 410 F.3d 1214, 1221 (10th Cir. 2005) (affirming FEMA's refusal to disclose location data of individual NFIP policyholders).

269. Compare *Kennedy v. Providence Hockey Club, Inc.*, 376 A.2d 329, 333 (R.I. 1977), in which a plaintiff was struck in the eye by a hockey puck while watching a game. The fact that she sat closer to the rink than was her habit because those were the only seats available "[did] not make the purchase of those seats any less voluntary." *Id.*

270. The examples tend to be small in number relative to the scale of the problem. See Alexander B. Lemann, *Stronger Than the Storm: Disaster Law in a Defiant Age*, 78 LA. L. REV. 437, 454–55 (2018). Voters in Harris County recently approved a \$2.5 billion bond issue to fund efforts to mitigate Houston's flood risk, \$184 million of which will be allocated to buyouts. Zach Despart, *Harris County Voters Pass \$2.5 Billion Flood Bond One Year After Harvey*, HOUS. CHRON. (Aug. 25, 2018), <https://www.houstonchronicle.com/news/houston-weather/hurricaneharvey/article/Harris-County-voters-pass-2-5-billion-flood-bond-13182842> [https://perma.cc/S39Y-6WCY].

who inherited her home and cannot locate the deed²⁷¹ and the titan of finance who chooses to build on the idyllic barrier island.²⁷²

In attempting to draw a line between those who occupy flood-prone homes as a matter of choice and those who do so out of some form of necessity, some general observations can be made. First, it seems obvious that there is a strong correlation between freedom and wealth. Poverty is inversely correlated with mobility,²⁷³ and positively correlated with flood risk.²⁷⁴ Indeed, one study that analyzed the effects of hurricanes on population changes in the Gulf Coast found that “advantaged groups” like young white people “are more likely to move out of or avoid moving into harm’s way while socially vulnerable groups have fewer choices.”²⁷⁵ Our sense of who has chosen to bear the risk of flooding should incorporate the idea that the less well-off are less likely to have had a meaningful opportunity to choose where they live. Importantly, this justification for socializing flood risk is distinct from an appeal to pure need.

Second, there is probably a correlation between housing tenure and the freedom of one’s choice to live in a particular place. While this will not be true in many cases, it seems likely that those who have lived in one place for many decades are less likely to have a meaningful opportunity to leave, whether because of strong social or cultural ties, limited means to undertake an expensive move, lower transferability of skills, age, or a host of other factors. Indeed, in its report on affordability, FEMA noted that its empirical findings “support[ed] our extensive anecdotal evidence that there is a significant population in the [special flood hazard area] of lower-income families who have either inherited their homes or are retirees who are particularly sensitive to the financial burden of flood insurance.”²⁷⁶ The

271. See, e.g., Kathy Finn, *Blighted Houses Still Mar New Orleans a Decade After Katrina*, REUTERS (Aug. 23, 2015), <https://www.reuters.com/article/us-usa-katrina-blight/blighted-houses-still-mar-new-orleans-a-decade-after-katrina-idUSKCN0QS0FE20150823> [<https://perma.cc/6UP3-ERA2>] (“Many of homes [sic] in the Lower Ninth Ward were handed down through several generations and it is unclear who holds the deed.”).

272. See, e.g., Katherine Clarke, *The Secluded Island Hideaways for America’s Rich and Famous*, WALL ST. J. (Aug. 23, 2018), <https://www.wsj.com/articles/the-secluded-island-hideaways-where-americas-rich-and-famous-escape-1535038830> [<https://perma.cc/HQ4X-8JZG>] (describing former Treasury Secretary and Goldman Sachs CEO Hank Paulson’s home on Little St. Simons Island, which he bought for almost \$33 million in 2015).

273. Schleicher, *supra* note 249, at 81–82 (noting that “mobility rates are lower among disadvantaged groups”).

274. See FED. EMERGENCY MGMT. AGENCY, *supra* note 108, at 11.

275. John R. Logan, Sukriti Issar & Zengwang Xu, *Trapped in Place? Segmented Resilience to Hurricanes in the Gulf Coast, 1970-2005*, 53 DEMOGRAPHY 1511, 1511 (2016).

276. FED. EMERGENCY MGMT. AGENCY, *supra* note 108, at 13.

converse of both factors is likely to be true as well. Those with plenty to spend are more likely to have a meaningful choice of where to live, as are those who have moved more recently.²⁷⁷ The NFIP could do more to divide these groups of policyholders, subsidizing those who made no choice to encounter a risk of flooding and penalizing those who have.

V. REFORM

Highlighting the importance of assumption of risk in the moral calculus of flood insurance leads to a subtle but important shift in emphasis in avenues for reform of the program. One goal of this Article has been to problematize the near-universal call for actuarial rates. Many have argued that there may be good reasons to subsidize rates for some portion of homeowners on the basis of need. In addition to this argument from need, an argument from involuntariness should be recognized. Because many homeowners do not knowingly choose to accept the risk of flooding they face, they arguably should not be made to bear the full actuarial cost of that risk. To return to the healthcare analogy, we should think of the costs of flooding as lying somewhere between the costs of smoking and the costs of being born female and thus subject to a hybrid system, in which insurance premiums are structured so that they are neither fully actuarial for everyone always nor so totally socialized that they bear no relationship to the quantum of risk each policyholder faces.

On the other hand, many people do understand the risk of flooding and do choose to expose themselves to it. My argument is not that everyone currently paying subsidized rates should be allowed to continue to do so indefinitely, only that imposing actuarial rates is in some cases morally problematic. There is also an important feedback loop at work here: actuarial rates are an important source of information about the flood risk a property faces and thus can create the condition of knowledge that helps justify their imposition. To put the point another way, creating an unlimited entitlement to subsidized premiums that runs with a property misleads people about the risk they face when they move in, and undermines the argument that they knowingly chose the risk and thus should not be entitled to pay subsidized rates going forward.

All of this suggests the need to focus on avenues of reform that get at the very heart of why the NFIP has proved to be such a difficult political puzzle.

277. For a particularly glaring example, consider the phenomenon of homeowners in upscale communities located on barrier islands who respond to severe storms by building larger homes. See Eli D. Lazarus et al., *Building Back Bigger in Hurricane Strike Zones*, 1 NATURE SUSTAINABILITY 759, 759 (2018) (finding that new homes built following hurricanes in five coastal communities had on average 55% larger footprints).

The major challenge is to reconcile the long-term need to manage our individual and collective exposure to flood risk without unfairly imposing short-term hardship on people who did not meaningfully choose to encounter this risk. There are two roles of government that are here locked in seemingly irreconcilable conflict: the obligation to enact rational policy that serves the national interest over the long term, on one hand, and the obligation to help those among us who are seen to be victims of circumstances beyond their control, on the other. At least part of the solution, the focus on assumption of risk suggests, lies in improving Americans' understanding of their risk of flooding and creating meaningful options to reduce that risk without in the process destroying the home equity of people who did not themselves have the benefits of knowledge and choice when they moved in.

A. Knowledge

Americans' knowledge of the flood risk they face is, in general, woeful. Improving this knowledge begins with improving and refining the scientific understanding of flood risk and how climate change will affect it in the coming decades. FEMA should also improve its ability to incorporate the latest science into its own risk calculations, which means both incorporating new data and models faster than it has done in the past and beginning the project of projecting how flood risks will change in the future. Keeping maps up to date is another obvious goal. Fortunately, all of these ideas have attracted attention, and this work is underway to varying degrees.

Flood Insurance Rate Maps, however, will always by necessity be highly complex and technical documents. With their bewildering array of zones and codes and symbols, they resist easy comprehension.²⁷⁸ It is worth thinking about abandoning the idea of the FIRM as the primary means of communicating flood risk to property owners. The former head of the NFIP felt the need to tell Floridians that they should ignore the lines on FEMA's maps and instead just buy flood insurance.²⁷⁹ There should be a way to capture that idea in map form. Such a map would ideally eschew bright lines and the misleading impression of safety they can create and instead show large zones with fuzzy edges giving people a sense that flood risk is something that should concern them. FEMA has made some admirable strides in this regard, setting up a dedicated, relatively easy to use website with zoomable maps instead of the large-file pdfs of yore, but the maps it

278. See URBAN FLOODING, *supra* note 205, at 34–35 (2018).

279. See *supra* notes 233–35 and accompanying text.

displays are still FIRMs, and are not designed to create a basic understanding of flood risk in the minds of non-experts.²⁸⁰ In 2009, FEMA began a project to modernize its maps, and part of that effort included developing “risk maps,” simpler, more colorful, less detailed, non-legally binding maps whose goal is to help communicate flood risk in a way that is legible to regular people.²⁸¹ However, these maps are not available in many parts of the country and are extraordinarily hard to locate on FEMA’s website.²⁸² New York City is currently developing two different maps: a FIRM that depicts current flood risk in all its complexity, and a forward-looking map designed to guide future development and land use decisions.²⁸³

It is also worth looking outside the map entirely. Reading a map is a challenge for many people. Maps are also easy to ignore. It was once fairly common to mark historical flood depths in a prominent place in small towns and cities. In the center of Ellicott City, Maryland, there is a wooden pillar supporting a railroad trestle that shows flood depths going back to 1868.²⁸⁴ On the coast of Japan, hundreds of stone tablets, some more than six hundred years old, warn of tsunamis past and future: “Do not build your homes below this point!”²⁸⁵ In New Orleans following Hurricane Katrina, a brown line marking the height of the standing water that filled much of the city remained

280. See *FEMA Flood Map Service Center*, FED. EMERGENCY MGMT. AGENCY, <https://msc.fema.gov/portal/home> [<https://perma.cc/KKS2-5V4M>] (last visited Mar. 4, 2019).

281. URBAN FLOODING, *supra* note 205, at 34–35.

282. See *id.* (noting that the maps are “not endorsed by FEMA”).

283. See Press Release, Fed. Emergency Mgmt. Agency, *supra* note 242. A small handful of other mapping tools that are designed to be more user-friendly have been developed. Texas A&M’s Institute for Hazard Mitigation Planning and Research has developed a website called “Buyers Be-Where” that displays a simple flood risk score for any address in one of six major cities. See BUYERS BE-WHERE, www.buyers-bewhere.com [<https://perma.cc/U3RR-T5WA>] (last visited Jan. 23, 2019). National Flood Services, a for-profit company that acts as a servicer of flood insurance policies, has developed a site called floodtools.com with similar functionality and national coverage. See FLOOD TOOLS, www.floodtools.com [<https://perma.cc/33AD-KCCP>] (last visited Jan. 23, 2018).

284. See *Ellicott City Flood Stages*, WIKIPEDIA, https://en.wikipedia.org/wiki/File:Ellicott_City_Flood_Stages.jpg [<https://perma.cc/FU5H-C3ES>] (last updated Mar. 21, 2012); see also URBAN FLOODING, *supra* note 205, at 34 (reproducing a photograph of flood depth marker in Cedar Rapids, Iowa).

285. Martin Fackler, *Tsunami Warnings, Written in Stone*, N.Y. TIMES (Apr. 20, 2011), <https://www.nytimes.com/2011/04/21/world/asia/21stones.html?smid=pl-share> [<https://perma.cc/YK68-4LM5>]. Of course, many of the stones were ignored as development boomed following the Second World War. *Id.*; see also ROBERT MEYER & HOWARD KUNREUTHER, *THE OSTRICH PARADOX: WHY WE UNDERPREPARE FOR DISASTERS* 21–22 (2017) (noting that effects of 2011 tsunami in Miyako were worsened by development in defiance of stones’ warning). Nevertheless, some towns have heeded the stones’ injunction. In Aneyoshi, a tiny village, no development has occurred below the stone; its warning has been supplemented by a blue line painted in the road marking the height of the waters. See Fackler, *supra*.

on every building. For years it served as a grim reminder of the water's depth. Although most of it has been cleaned away, there have been efforts to publicly mark the depth of the flood.²⁸⁶ This idea could be expanded.²⁸⁷ Streets in flood zones could be painted blue. We might also consider tangible, visible projections of the effects of sea level rise, such as pillars indicating the projected water depth in 2100.

Improving enforcement of the NFIP's purchase mandate would also improve homeowners' knowledge of the risk they face. Flood insurance premiums set at actuarial rates have long been recognized as important signals.²⁸⁸ In addition to undermining the financial viability of the program, underenforcement of the purchase mandate deprives homeowners of the important signal that being required to purchase flood insurance sends. Even when homeowners pay subsidized rates, they should be informed of what their rates would be if they reflected the full measure of the risk they face.

Finally, a federal, mandatory notice requirement that applies to any real estate transaction would do much to improve the state of knowledge when people move. This idea is beginning to gain traction, as criticism has been levelled at the current patchwork of state laws (some better than others) that govern disclosure of flood risk.²⁸⁹ In Congress, several of the most recent proposals for reform of the NFIP have included notice provisions.²⁹⁰ Helping prospective homeowners understand the risk at the moment they choose whether to take it on could be enormously powerful.

286. Two artists have painted telephone poles blue up to the depth of standing water along a major boulevard. Doug McCash, *Art Critic Doug McCash's Guide to 19 Pieces of Outdoor New Orleans Art*, TIMES-PICAYUNE, http://blog.nola.com/dougmaccash/2009/04/art_critic_doug_maccash_rates_15.html [<https://perma.cc/FF44-HM8W>] (last updated Apr. 8, 2009).

287. URBAN FLOODING, *supra* note 205, at 34 ("Use of high-water mark signs [] that identify the height of historical floods can also alert residents to their risks and lead them to possible mitigation methods.").

288. *See Scales, supra* note 13, at 44.

289. *See supra* notes 263–67 and accompanying text.

290. Flood Insurance Affordability and Sustainability Act of 2017, S. 1313, 115th Cong. § 203 (directing FEMA to promulgate regulations "for the disclosure of flood risk hazards with respect to any residential or commercial property that is offered for sale"); 21st Century Flood Insurance Reform Act, H.R. 2874, 115th Cong. § 109(a)–(b) (passed by House, Nov. 14, 2017) (requiring state and local governments to impose "a duty on any seller or lessor of improved real estate located [in a flood zone] to provide to any purchaser or lessee of such property a property flood hazard disclosure").

B. Choice

Much could also be done to empower homeowners to choose to expose themselves to the risk of flood—or to avoid it. One fruitful target of reform is FEMA’s buyout program. Participation in purely voluntary buyout programs has typically been regarded as disappointing.²⁹¹ To many who study the issue, there are various ways in which buyouts could be made more appealing.²⁹² Streamlining the process of being bought out would make the prospect more palatable, as would creating a national, freestanding program of unlimited duration rather than the patchwork federal/state partnerships that currently spring up after major storms and die out several years later.²⁹³

Another related option is to explore large-scale buyouts of entire neighborhoods or towns rather than piecemeal buyouts of whoever is willing to leave. This approach has the benefit of avoiding the “jack-o-lantern” effect of leaving expensive, unattractive gaps in a community as its population declines, shouldering local governments with expensive infrastructure to maintain and less tax base with which to do it.²⁹⁴ There have been a few scattered successes relocating entire communities, but they have all been small and rural and therefore enjoyed access to nearby sites to which they could be moved.²⁹⁵ In recent years, many have also been Native American communities with tribal governments.²⁹⁶ Whether this approach is workable in more densely populated areas is an open question. So far, the use of eminent domain to force holdouts away from flood zones is a political non-starter.

291. See Christopher Flavelle, *A New Strategy for Climate Change? Retreat*, BLOOMBERG, (Aug. 22, 2016), <https://www.bloomberg.com/view/articles/2016-08-22/nj-s-blue-acres-program-a-new-strategy-for-climate-change> [<https://web.archive.org/web/20180208072748/https://www.bloomberg.com/view/articles/2016-08-22/nj-s-blue-acres-program-a-new-strategy-for-climate-change>] (detailing struggles of New Jersey’s Superstorm Sandy Blue Acres program, which in 2016, four years after the storm, had purchased 471 homes out of 14,865 that were eligible).

292. See Sherri Brokopp Binder, Charlene K. Baker & John P. Barile, *Rebuild or Relocate? Resilience and Postdisaster Decision-Making After Hurricane Sandy*, 56 AM. J. COMMUNITY PSYCHOL. 180, 194 (2015); Anamaria Bukvic & Graham Owen, *Attitudes Towards Relocation Following Hurricane Sandy: Should We Stay or Should We Go?*, 41 DISASTERS 101, 103–04 (2017); A.R. Siders, *Social Justice Implications of US Managed Retreat Buyout Programs*, 152 CLIMATIC CHANGE 239 (2019).

293. Bukvic & Owen, *supra* note 292, at 103–04 (“[T]here is not a single government agency that has the authority to administer a relocation programme even if people want it, there is no funding designated for this process, no criteria for the identification of relocation destinations, and no mechanisms for public participation.”).

294. See Flavelle, *supra* note 291.

295. See Lemann, *supra* note 270, at 490–92.

296. *Id.*

C. The Effect of Assumption

There are also ways in which the assumption of risk idea could be incorporated more strongly into the rate structure of the NFIP. Currently, many homeowners living in homes that predate the issuance of a FIRM are entitled to subsidized rates, regardless of when they moved in. This approach may have made sense from the perspective of assumption of risk when it was first implemented, but it is harder to justify today. If an old house is sold to a new buyer who makes a free choice to live there with full knowledge of the risk it faces, it is hard to see why the age of the house should matter. The assumption of risk principle suggests that entitlement to actuarial rates should turn on conditions having to do with an individual person's choices, not the physical characteristics of the home they live in. A focus on assumption of risk thus supports the idea that subsidized rates should be phased out when properties change hands.

Biggert-Waters contained a provision eliminating subsidized rates for new homebuyers and new policyholders.²⁹⁷ Unfortunately, this provision was repealed.²⁹⁸ The problem, as Congress quickly learned from many outraged constituents, is that while this change may not have had any effect on the rates current homeowners were obligated to pay, it did affect the purchase price their homes could command, and thus their home equity.²⁹⁹ One way of forcing new homebuyers to assume more of the risk of flooding without penalizing current homeowners would be to buy out whatever portion of the owner's equity would be destroyed by increasing their flood insurance premiums, although this is sure to be expensive and controversial. An easier approach, and one that has attracted some interest from Congress, is to phase out subsidized rates gradually, with increases capped at, say, 10% per year, apparently on the theory that the economic pain will be much easier to manage if it is inflicted slowly.³⁰⁰

297. Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No. 112-141, § 100205(a)(1)(B), 126 Stat. 916.

298. Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, § 3, 128 Stat. 1021-22 (striking portions of Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No. 112-141, § 100205, 126 Stat. 916, codified at 42 U.S.C. § 4014(g)(1)-(2)).

299. See Alvarez & Robertson, *supra* note 48; Coral Davenport, *Popular Flood Insurance Law Is Target of Both Political Parties*, N.Y. TIMES, (Jan. 28, 2014), <https://www.nytimes.com/2014/01/29/us/politics/popular-flood-insurance-law-is-target-of-both-political-parties.html> [<https://perma.cc/ELW4-Q5MT>] (noting that after passage of Biggert-Waters, "homeowners near coasts, rivers and wetlands saw their insurance rates soar and their property values plummet," leading to "frustration [that] erupted into a grass-roots lobbying campaign to roll back" Biggert-Waters).

300. See Sustainable, Affordable, and Efficient (SAFE) National Flood Insurance Program Reauthorization Act of 2017, H.R. 3285, 115th Cong. § 102(b) ("[T]he Administrator may not,

The fact of being flooded arguably has a significant impact on an owner's knowledge of the risk she faces, and it could also be made to have a more significant impact on flood insurance premiums.³⁰¹ The NFIP currently requires that an old home be elevated above base flood elevation if it is more than 50% damaged in a flood. This threshold could be reduced, so that any amount of flood damage leading to an insurance claim destroys the home's entitlement to subsidized rates going forward. Of course, the 50% damage threshold also points to the importance of choice: a home that is "substantially damaged," to use FEMA's term, is in a sense a blank slate. At the very least the focus on assumption of risk supports maintaining this requirement.

Finally, the NFIP might consider treating coastal areas differently from inland areas. The long-term risk of flooding for those living on the beach is certainly much more obvious, and more serious, than for those living elsewhere. The NFIP currently does not account for the future risk of sea level rise in any way. That should certainly change at least as to the creation of flood maps and the understanding of flood risk that goes into the calculation of actuarial rates. In the fall of 2017 the House of Representatives passed an NFIP reform bill—never taken up by the Senate—that, among other things, directed FEMA to consider explicitly the difference between the risks faced by coastal and inland properties in setting rates.³⁰² That difference might also be made to affect entitlement to subsidized rates, or even entitlement to participate in the NFIP at all. There may be communities whose prospects, even in the relatively near term, are so dim that they should be regarded as uninsurable.

CONCLUSION

Reform of the National Flood Insurance Program is a crucially important part of the work needed to prepare the United States for a near future in which

in any year, increase the amount of any covered cost by an amount that is more than 10 percent, as compared with the amount of the covered cost during the previous year.").

301. While courts applying the doctrine of assumption of risk in torts cases have insisted on its subjectivity, they have been willing to conclude that a plaintiff had the requisite knowledge when she witnessed the risk being realized in the past. *See Kennedy v. Providence Hockey Club, Inc.*, 376 A.2d 329, 333 (R.I. 1977) (affirming judgment for defendant on assumption of risk grounds where plaintiff, a spectator at a hockey game who was hit in the eye by a flying puck, had attended thirty or forty games in the same arena and "was familiar with the flying-puck syndrome. The only reasonable inference suggesting itself to us is that she knew there was a risk that the puck would take flight and come to rest somewhere in the crowd.").

302. Craig, *supra* note 13, at 30 (citing 21st Century Flood Insurance Reform Act, H.R. 2874, 115th Cong. § 105(b)–(c) (as passed by House, Nov. 16, 2017)).

flooding becomes more common and costly than it already is. And yet changing the NFIP's rate structure so that all policyholders pay fully actuarial rates—the near-universal recommendation of policy experts, academics, and pundits—has proved to be excruciatingly difficult. In part this is because many homeowners did not knowingly choose to encounter the risk they face, making it morally problematic to saddle them with its full cost. Focusing on issues of knowledge and choice in flood risk highlights the need to improve these aspects of our approach to the problem. FEMA should do more to help individuals understand the risk they face, and to offer them buyouts if they do not like what they learn. Ultimately, the goal must be to transition away from subsidized premiums in a way that is morally, and therefore politically, palatable.